3.1.2 Routine Monitoring

3.1.2.1 POC Monitoring

This objective deals with monitoring discharges from the terminal ponds into Woman and Walnut Creeks and streamflow at the additional POCs downstream at Indiana Street to demonstrate compliance with RFLMA surface-water quality standards (see Table 1 of Attachment 2 to RFLMA). Water-quality data at POCs are reportable under RFLMA when the applicable compliance parameter(s) are greater than the corresponding Table 1 value(s) (see Appendix D). Terminal pond discharges are monitored by POCs GS11, GS08, and GS31. Walnut Creek is monitored at Indiana Street by POC GS03. Woman Creek is monitored at Indiana Street by POC GS01. These locations are shown on Figure 3-2. Sampling and data evaluation protocols are summarized in Table 3-2.

Table 3-2. Sampling and Data Evaluation Protocols at POCs

Location Code	Location Description	Sample Types/Frequencies	Analytes	Data Evaluation
GS01	Woman Creek at Indiana Street	Continuous flow-paced composites; frequency varies (target is 25−35 per year)[a]	total Pu, Am, and U isotopes[b] [TSS[d]]	see Figure 5 in Appendix D
GS03	Walnut Creek at Indiana Street	Continuous flow-paced composites; frequency varies (target is 20−40 per year)[a]	total Pu, Am, U isotopes[b], and nitrate[c] [TSS[d]]	see Figure 5 in Appendix D
GS08	Pond B-5 Outlet	Continuous flow-paced composites; frequency varies (target is 0−20 per year)	total Pu, Am, U isotopes[b], and nitrate[c]	see Figure 5 in Appendix D
GS11	Pond A-4 Outlet	Continuous flow-paced composites; frequency varies (target is 0−15 per year)	total Pu, Am, U isotopes[b], and nitrate[c]	see Figure 5 in Appendix D
GS31	Pond C-2 Outlet	Continuous flow-paced composites; frequency varies (target is 0−5 per year)	total Pu, Am, and U isotopes[b]	see Figure 5 in Appendix D

Notes [a]Frequency depends on available flow; samples are segregated by water origin (baseflow or pond discharge).
[b]U isotopes are U-233,234 + U-235 + U-238.
[c]Collected during pond discharges only; nitrate is analyzed as nitrate+nitrite as N; this result is conservatively compared to the nitrate standard only.
[d]Total suspended solids (TSS) is analyzed when the composite sampling period is within TSS hold-time limits.

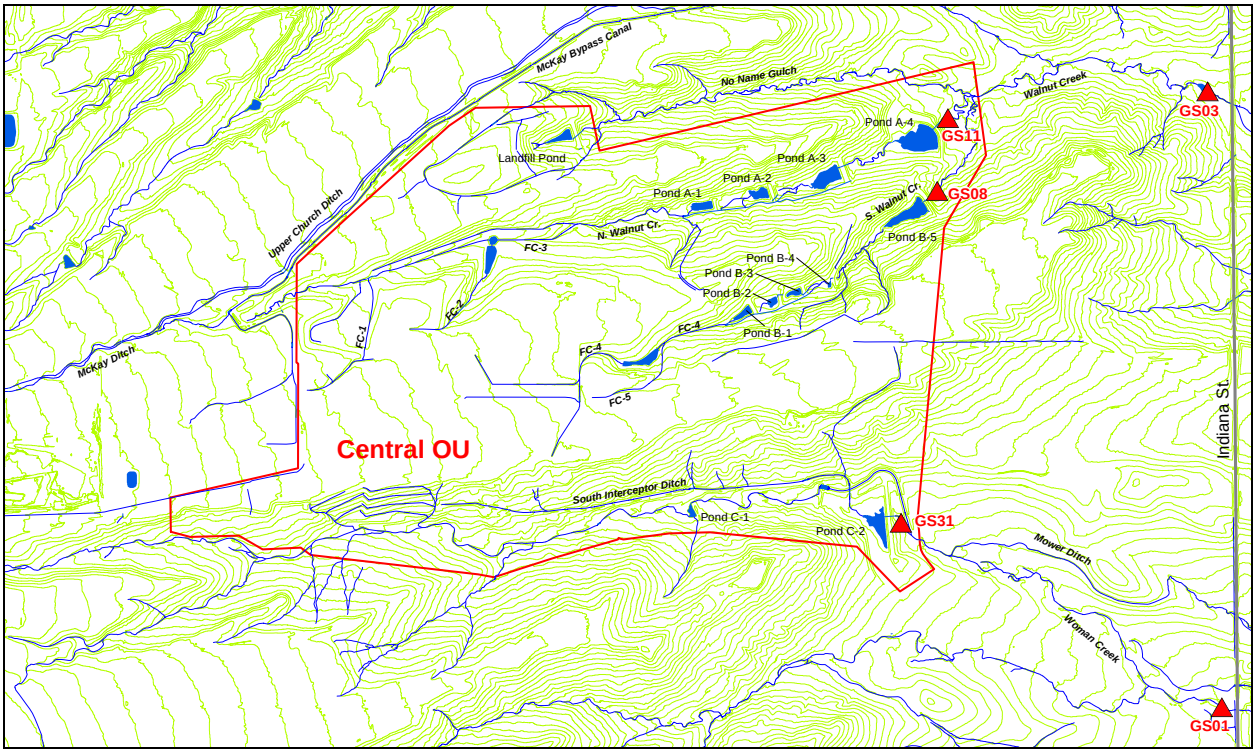


Figure 3-2. POC Monitoring Locations

The following sections include summary tables and plots showing the applicable 30-day and 12-month rolling averages for the POC analytes. The evaluations include all results that were not rejected through the verification and validation process. Data are generally presented to decimal places as reported by the laboratories. Accuracy should not be inferred; minimum detectable concentrations/activities and analytical error are often greater than the precision presented. When a sample has a corresponding field duplicate, the value used in calculations is the arithmetic average of the "real" and "duplicate" values. When a sample has multiple "real" analyses (Site-requested "reruns"), the value used in calculations is the arithmetic average of the multiple "real" analyses.[3]

Refer to Appendix B, which contains the water-quality data, for further information.

Location GS01

Monitoring location GS01 is located on Woman Creek at Indiana Street (Figure 3-2). The Woman Creek headwaters, the southern portion of the COU, and Pond C-2 contribute flow to GS01.

[3] Significant differences in values for a data pair are an indication of potential problems with sample preparation and/or analysis. Under these circumstances, an applicable value to be used for comparison cannot be determined with sufficient confidence to make compliance decisions. As such, an evaluation of the duplicate error ratio (DER) or relative percent difference (RPD), depending on the analyte, is required to assess the representativeness of the sample and its usability for compliance decisions (see Section 8.2.3 of the RFSOG for discussion).

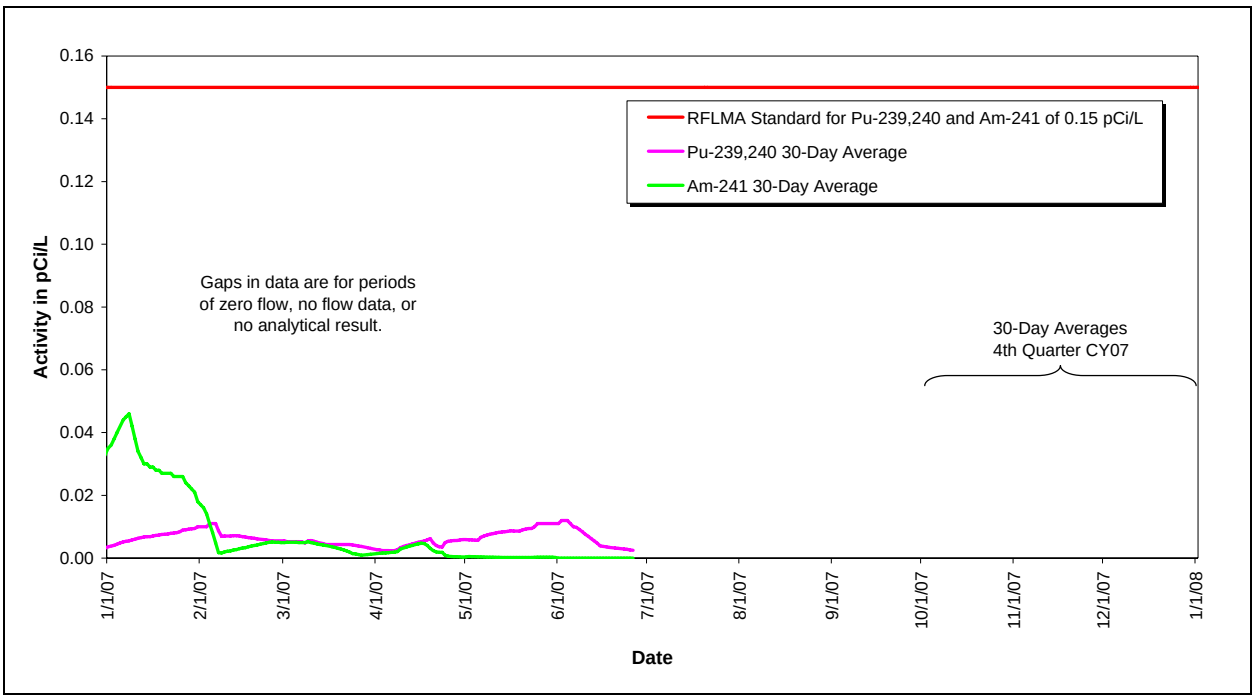
Table 3-3 shows that all of the annual average Pu and Am activities were well below the RFLMA standard of 0.15 pCi/L. Additionally, the long-term Pu and Am averages (1997−2007) are well below 0.15 pCi/L. The average total U activities are all well below the RFLMA standard for Woman Creek of 11 pCi/L.

Table 3-3. Annual Volume-Weighted Average Radionuclide Activities at GS01 for 1997−2007

Calendar Year	Volume-Weighted Average Activity (pCi/L)		
	Am-241	Pu-239,240	Total U
1997	0.003	0.007	NA
1998	0.006	0.006	NA
1999	0.005	0.008	NA
2000	0.004	0.003	NA
2001	0.004	0.006	NA
2002	0.002	0.001	NA
2003	0.002	0.004	1.24
2004	0.003	0.002	3.56
2005	0.004	0.003	2.50
2006	0.012	0.003	4.76
2007	0.002	0.007	1.09
Total (1997−2007)	0.004	0.006	1.70

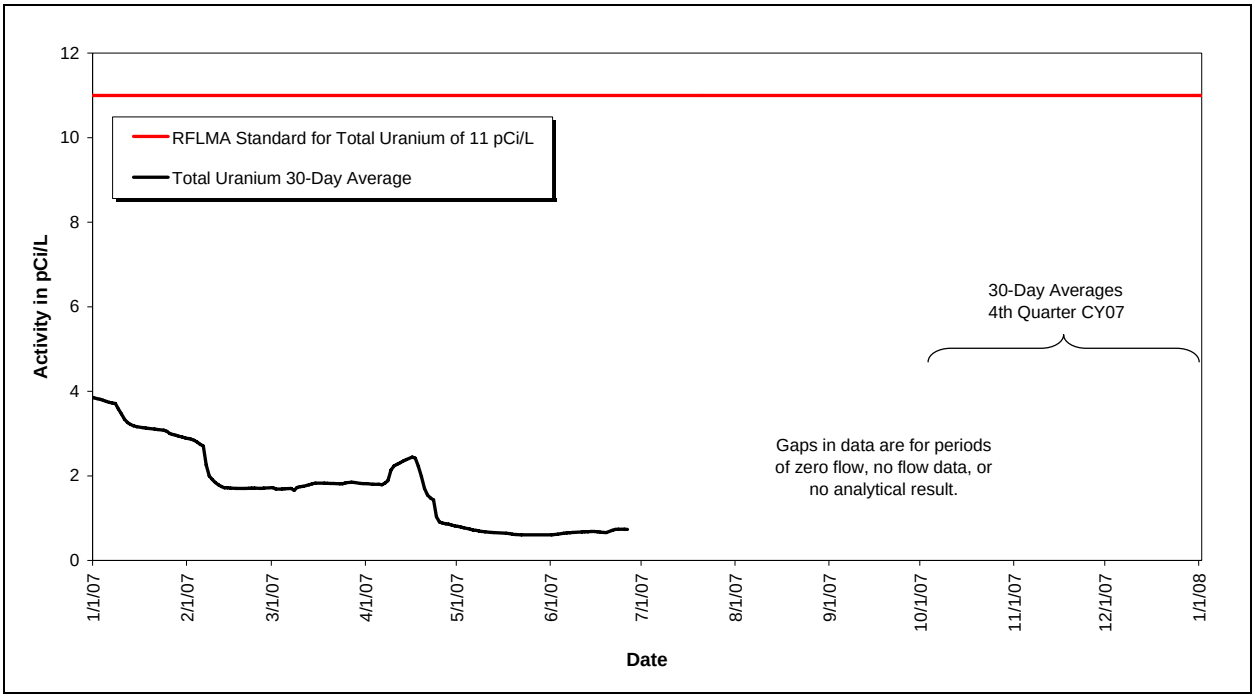
Notes: Collection of total U data began on February 3, 2003. NA = not applicable.

Figure 3-3 and Figure 3-4 show no occurrences of reportable 30-day averages for the year.



Note: There has been no flow at GS01 since June 27, 2007.

Figure 3-3. Volume-Weighted 30-Day Average Pu and Am Activities at GS01: Calendar Year Ending Fourth Quarter CY 2007



Note: There has been no flow at GS01 since June 27, 2007.

Figure 3-4. Volume-Weighted 30-Day Average Total U Activities at GS01: Calendar Year Ending Fourth Quarter CY 2007

Location GS03

Monitoring location GS03 is located on Walnut Creek at Indiana Street (Figure 3-2). The Walnut Creek headwaters, the majority of the COU, Pond A-4, and Pond B-5 contribute flow to GS03.

Table 3-4 shows that all of the annual average Pu and Am activities were well below 0.15 pCi/L. Additionally, the long-term Pu and Am averages (1997−2007) are well below 0.15 pCi/L. The average total U and nitrate+nitrite concentrations are all well below the RFLMA standard for Walnut Creek of 10 pCi/L and 10 milligrams per liter (mg/L), respectively.

Figure 3-5, Figure 3-6, and Figure 3-7 show no occurrences of reportable 30-day averages for the year.

Table 3-4. Annual Volume-Weighted Average Radionuclide Activities and Nitrate+Nitrite as N Concentrations at GS03 for 1997−2007

Calendar Year	Volume-Weighted Average Activity (pCi/L)			Volume-Weighted Average Concentration (mg/L)[a]
	Am-241	Pu-239,240	Total U	Nitrate+Nitrite as N
1997	0.014	0.026	NA	NA
1998	0.010	0.014	NA	NA
1999	0.009	0.015	NA	NA
2000	0.007	0.005	NA	NA
2001	0.005	0.009	NA	NA
2002	0.006	0.012	NA	NA
2003	0.005	0.006	1.79	NA
2004	0.008	0.008	1.76	NA
2005	0.022	0.008	3.95	NA (no pond discharges after 10/13/05)
2006	NA (no flow)	NA (no flow)	NA (no flow)	NA (no pond discharges)
2007	0.002	0.006	3.76	2.34
Total (1997−2007)	0.009	0.012	2.42	2.34

Notes: Collection of total U data began on November 5, 2002. NA = not applicable.
[a]For pond discharge periods only; nitrate+nitrite as N sampling began on October 13, 2005.

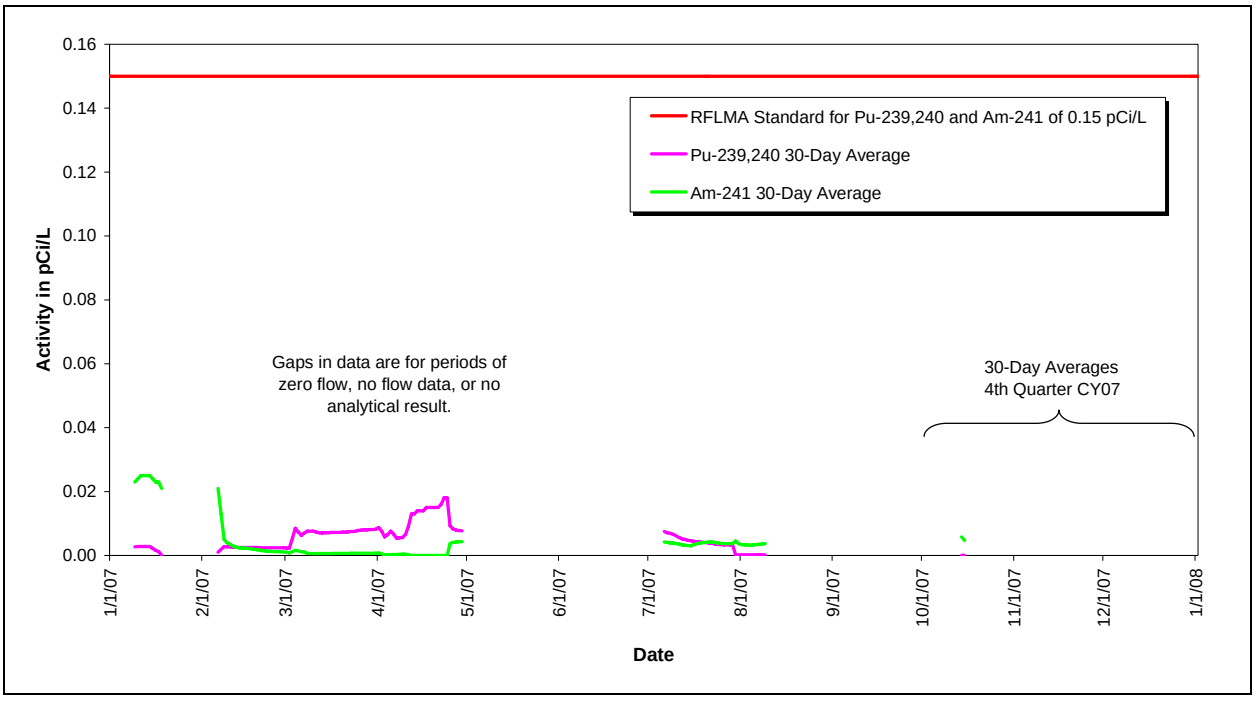


Figure 3-5. Volume-Weighted 30-Day Average Pu and Am Activities at GS03: Calendar Year Ending Fourth Quarter CY 2007

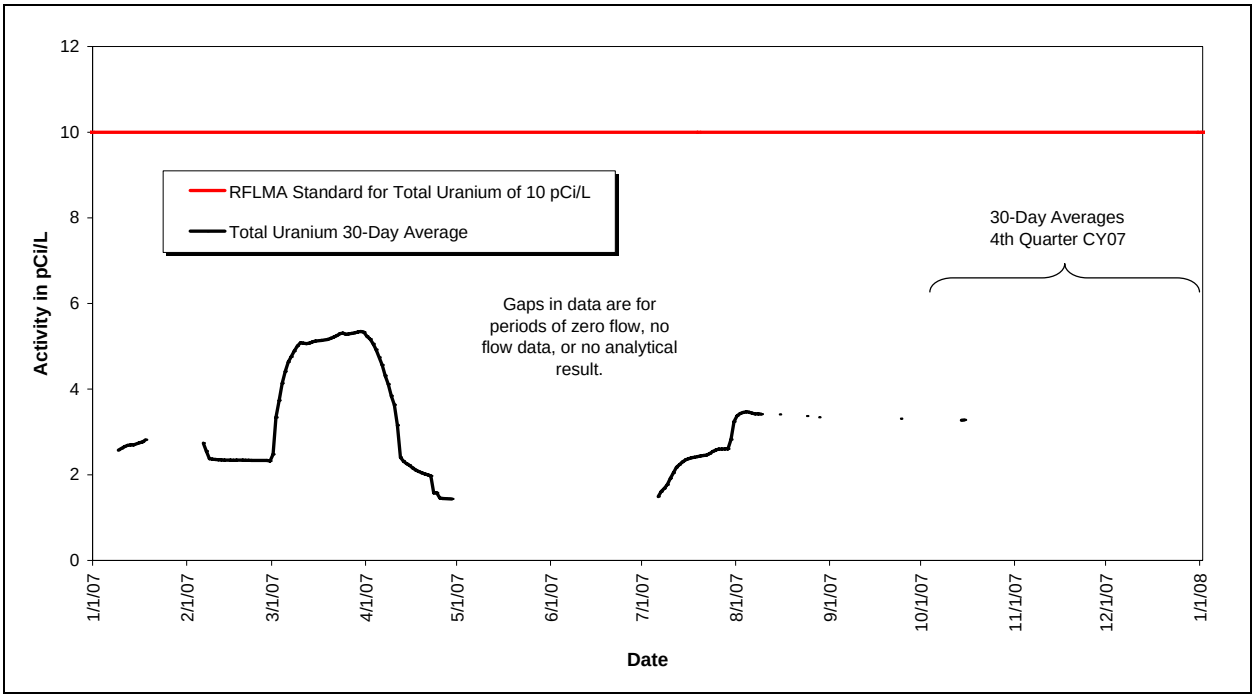


Figure 3-6. Volume-Weighted 30-Day Average Total U Activities at GS03: Calendar Year Ending Fourth Quarter CY 2007

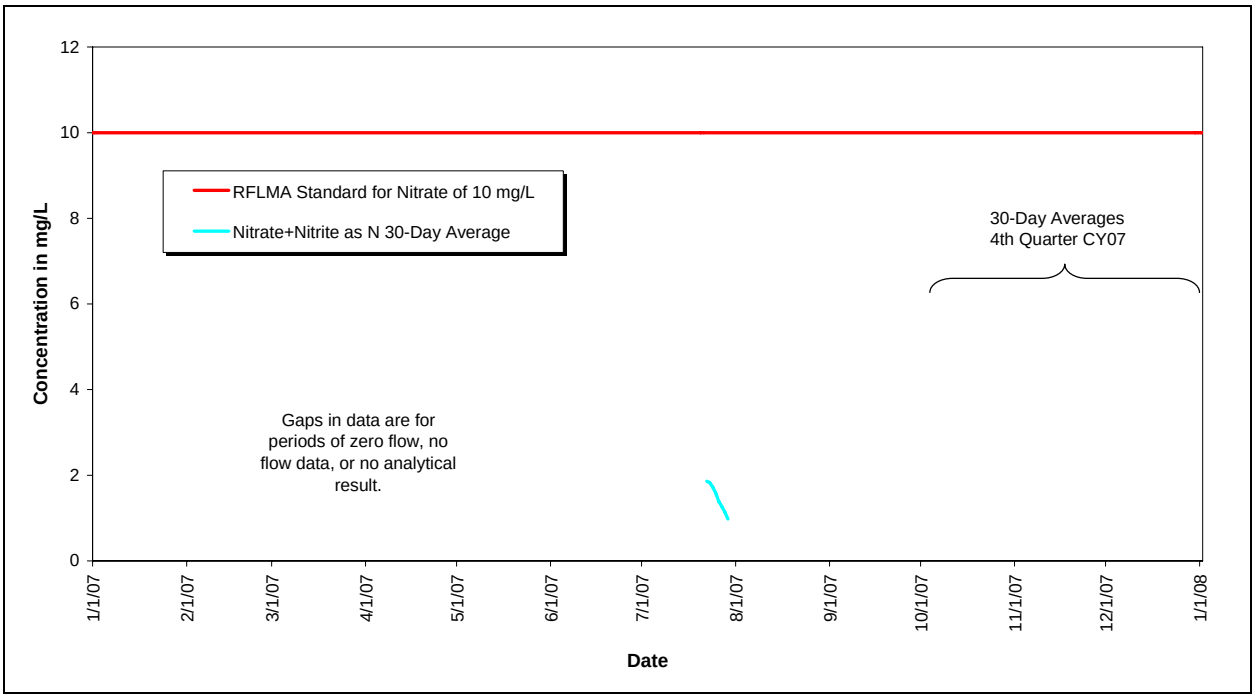


Figure 3-7. Volume-Weighted 30-Day Average Nitrate + Nitrite as N Concentrations at GS03: Calendar Year Ending Fourth Quarter CY 2007

Location GS08

Monitoring location GS08 is located on South Walnut Creek at the outlet of Pond B-5 (Figure 3-2). The central portion of the COU contributes flow to Pond B-5.

Table 3-5 shows that all of the annual average Pu and Am activities were well below 0.15 pCi/L. Additionally, the long-term Pu and Am averages (1997−2007) are well below 0.15 pCi/L. The average total U activities have shown recent increases due to contributions from GS10 (see Section 3.1.2.2). Nitrate+nitrite concentrations are well below 10 mg/L.

Figure 3-8, Figure 3-9, and Figure 3-10 show no occurrences of reportable 12-month rolling averages for the year.

Table 3-5. Annual Volume-Weighted Average Radionuclide Activities and Nitrate+Nitrite as N Concentrations at GS08 for 1997−2007

Calendar Year	Volume-Weighted Average Activity (pCi/L)			Volume-Weighted Average Concentration (mg/L)[a]
	Am-241	Pu-239,240	Total U	Nitrate+Nitrite as N
1997	0.008	0.006	1.69	NA
1998	0.006	0.008	2.33	NA
1999	0.015	0.046	1.38	NA
2000	0.029	0.047	0.93	NA
2001	0.004	0.006	1.24	NA
2002	0.003	0.002	0.68	NA
2003	0.006	0.026	1.37	NA
2004	0.009	0.009	1.24	NA
2005	0.021	0.008	6.11	NA (no pond discharge after 10/13/05)
2006	NA (no discharge)	NA (no discharge)	NA (no discharge)	NA (no discharge)
2007	0.002	0.003	8.45	0.38
Total (1997−2007)	0.012	0.022	1.71	0.38

Notes: NA = not applicable.
[a]Nitrate+nitrite as N sampling began on October 13, 2005.

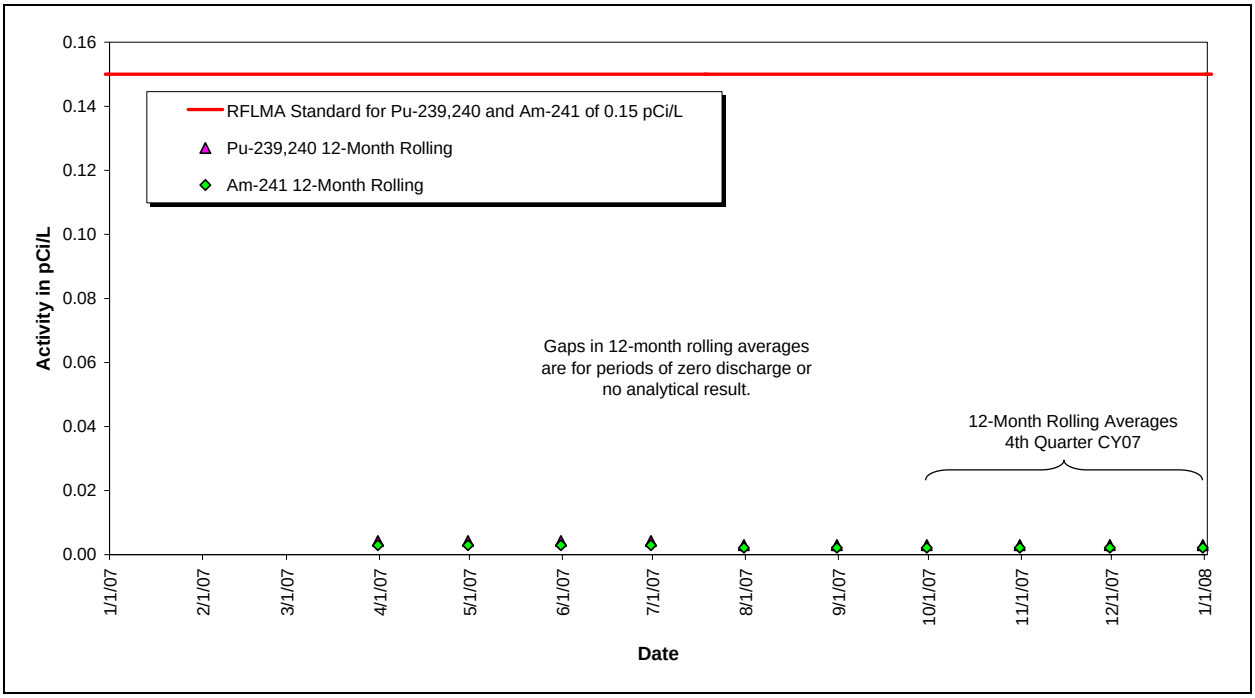


Figure 3-8. Volume-Weighted 12-Month Rolling Average Pu and Am Activities at GS08: Calendar Year Ending Fourth Quarter CY 2007

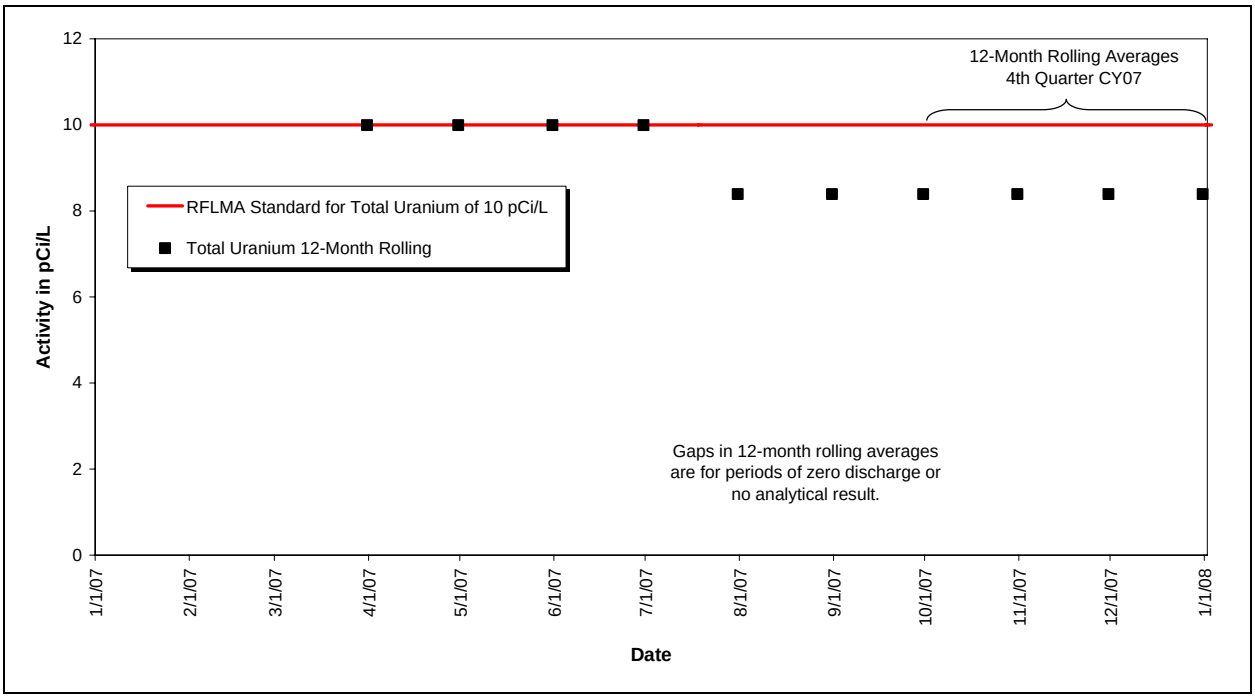
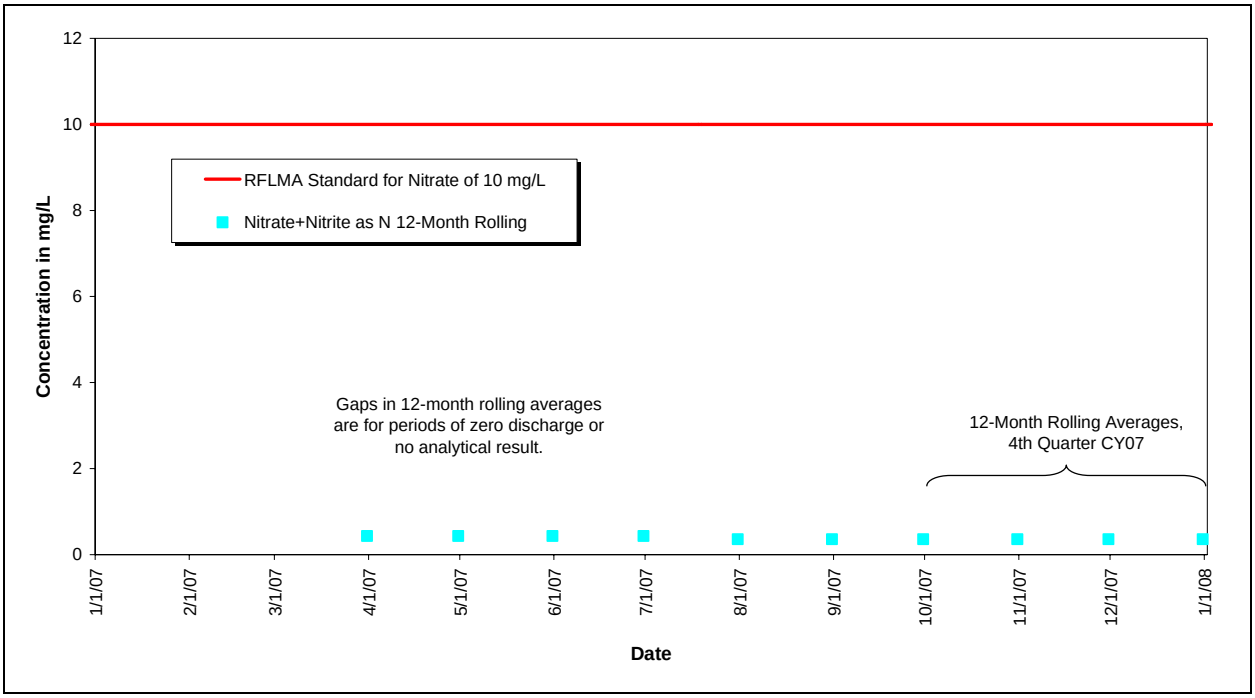


Figure 3-9. Volume-Weighted 12-Month Rolling Average Total U Activities at GS08: Calendar Year Ending Fourth Quarter CY 2007



Note: Nitrate+nitrite as N 12-month averages are conservatively compared to the nitrate standard only.

Figure 3-10. Volume-Weighted 12-Month Rolling Average Nitrate+Nitrite as N Concentrations at GS08: Calendar Year Ending Fourth Quarter CY 2007

Location GS11

Monitoring location GS11 is located on North Walnut Creek at the outlet of Pond A-4 (Figure 3-2). The northern portion of the COU contributes flow to Pond A-4.

Table 3-6 shows that all of the annual average Pu and Am activities were well below 0.15 pCi/L. Additionally, the long-term Pu and Am averages (1997−2007) are well below 0.15 pCi/L. The average total U and nitrate+nitrite concentrations are all well below 10 pCi/L and 10 mg/L, respectively.

Figure 3-11, Figure 3-12, and Figure 3-13 show no occurrences of reportable 12-month rolling averages for the year.

Table 3-6. Annual Volume-Weighted Average Radionuclide Activities and Nitrate+Nitrite as N Concentrations at GS11 for 1997−2007

Calendar Year	Volume-Weighted Average Activity (pCi/L)			Volume-Weighted Average Concentration (mg/L)[a]
	Am-241	Pu-239,240	Total U	Nitrate+Nitrite as N
1997	0.005	0.008	1.82	NA
1998	0.011	0.004	2.18	NA
1999	0.003	0.007	1.76	NA
2000	0.001	0.018	2.45	NA
2001	0.003	0.002	2.89	NA
2002	0.003	0.000	2.29	NA
2003	0.003	0.002	2.91	NA
2004	0.006	0.002	2.71	NA
2005	0.022	0.002	1.78	NA (no pond discharge after 10/13/05)
2006	NA (no discharge)	NA (no discharge)	NA (no discharge)	NA (no discharge)
2007	0.001	0.007	3.77	3.02
Total (1997−2007)	0.006	0.006	2.26	3.02

Notes: NA = not applicable.
[a]Nitrate+nitrite as N sampling began on October 13, 2005.

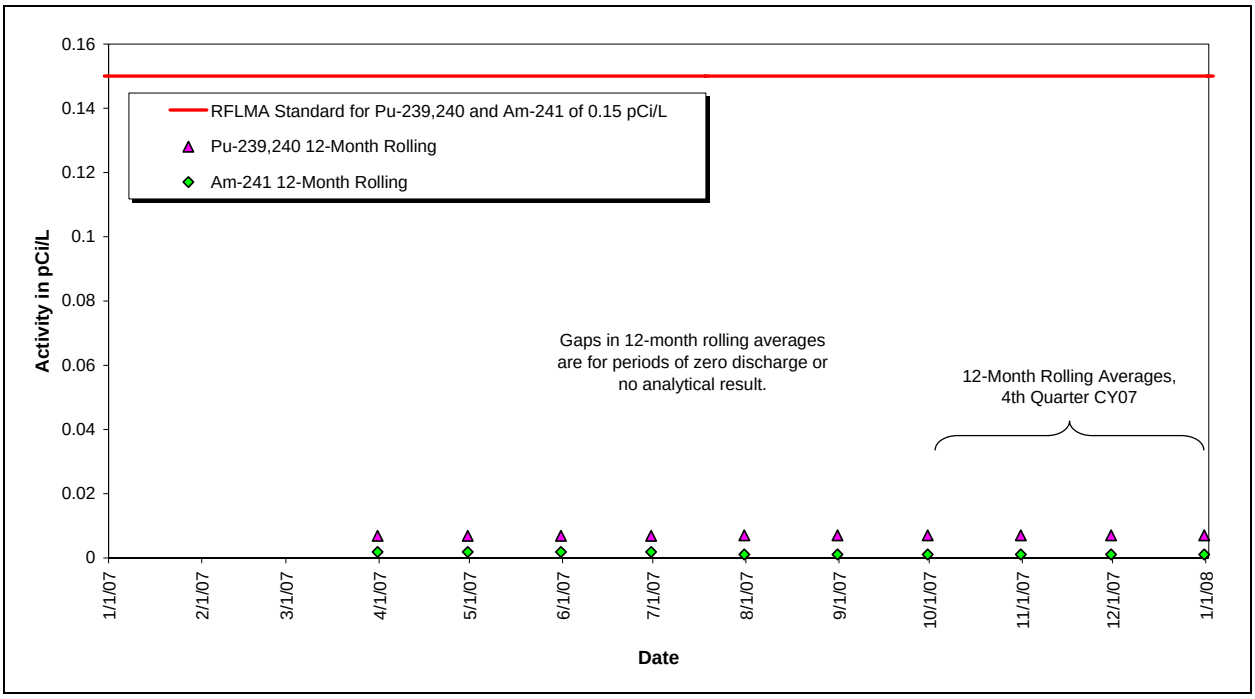


Figure 3-11. Volume-Weighted 12-Month Rolling Average Pu and Am Activities at GS11: Calendar Year Ending Fourth Quarter CY 2007

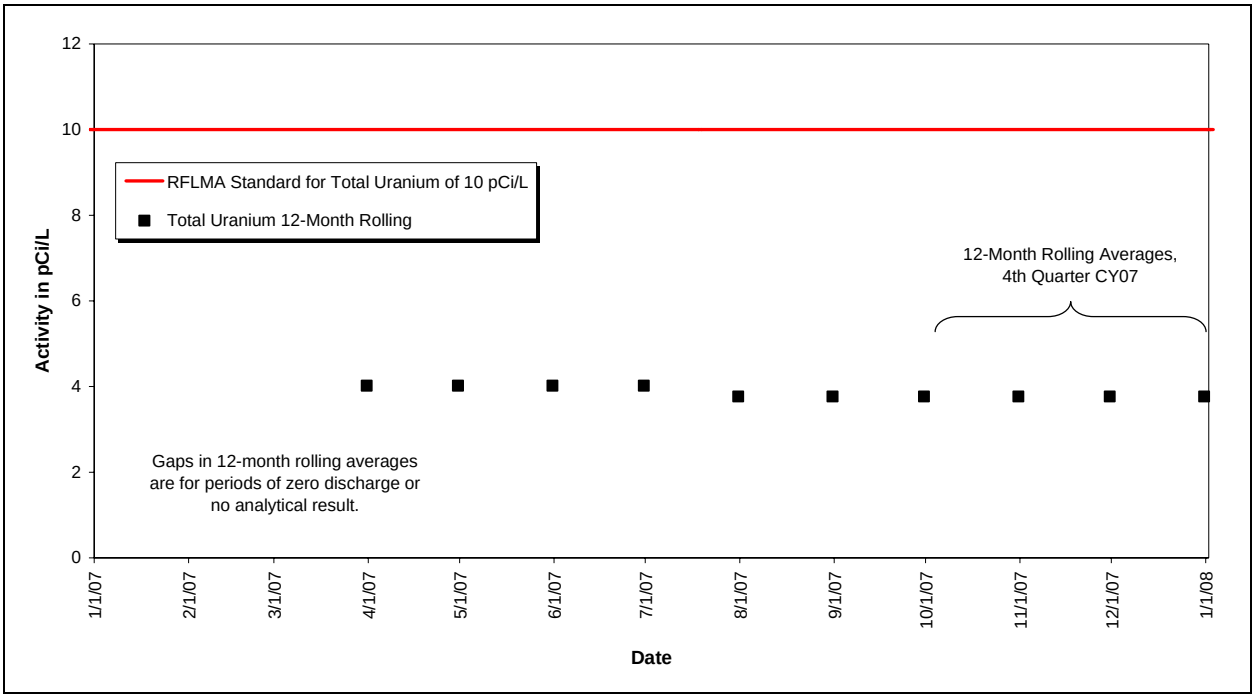
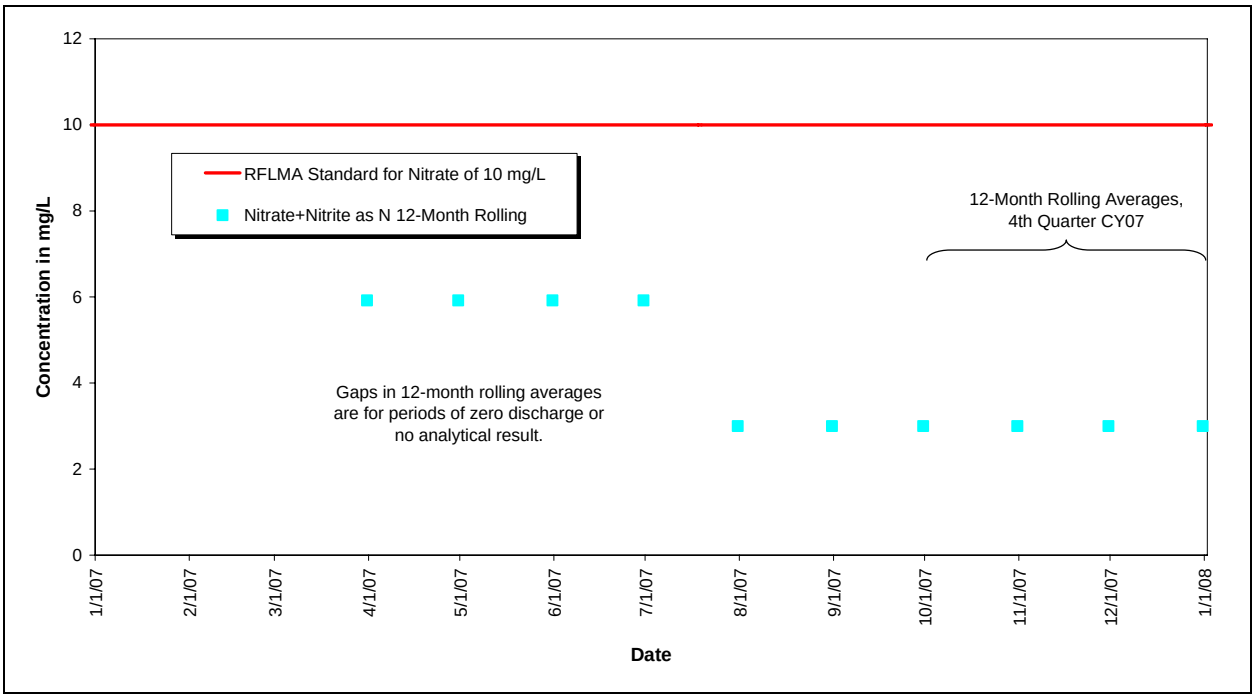


Figure 3-12. Volume-Weighted 12-Month Rolling Average Total U Activities at GS11: Calendar Year Ending Fourth Quarter CY 2007



Note: Nitrate+nitrite as N 12-month averages are conservatively compared to the nitrate standard only.

Figure 3-13. Volume-Weighted 12-Month Rolling Average Nitrate+Nitrite as N Concentrations at GS11: Calendar Year Ending Fourth Quarter CY 2007

Location GS31

Monitoring location GS31 is located on Woman Creek at the outlet of Pond C-2 (Figure 3-2). The southern portion of the COU contributes flow to Pond C-2.

Pond C-2 was not discharged during CY 2007. The last discharge occurred during July 1−July 14, 2005. Therefore, no 12-month rolling averages are calculated after June 30, 2006, and no compliance plots are presented.

Table 3-7 shows that all of the annual average Pu and Am activities were below 0.15 pCi/L. Additionally, the long-term Pu and Am averages (1997−2007) are below 0.15 pCi/L. The average U activities are all well below 11 pCi/L.

Table 3-7. Annual Volume-Weighted Average Radionuclide Activities at GS31 for 1997−2007

Calendar Year	Volume-Weighted Average Activity (pCi/L)		
	Am-241	Pu-239,240	Total U
1997	0.008	0.017	2.10
1998	0.018	0.003	2.53
1999	0.010	0.043	2.70
2000	No C-2 discharge	No C-2 discharge	No C-2 discharge
2001	0.013	0.021	1.25
2002	0.015	0.089	2.43
2003	0.006	0.015	1.62
2004	0.010	0.021	1.65
2005	0.008	0.020	4.07
2006	No C-2 discharge	No C-2 discharge	No C-2 discharge
2007	No C-2 discharge	No C-2 discharge	No C-2 discharge
Total (1997−2007)	0.011	0.019	2.13

Note: NA = not applicable.

3.1.2.2 POE Monitoring

This objective deals with monitoring runoff and baseflow from the interior of the COU to the A-, B-, and C-Series Ponds to demonstrate compliance with surface-water-quality standards (see Table 1 of Attachment 2 to RFLMA). Water-quality data are reportable under RFLMA when the applicable compliance parameter(s) are greater than the corresponding Table 1 value(s) (see Appendix D). Surface water is monitored by POEs SW093, GS10, and SW027 on North Walnut Creek, South Walnut Creek, and the SID, respectively. These locations are shown on Figure 3-14. Sampling and data evaluation protocols are summarized in Table 3-8.

Table 3-8. Sampling and Data Evaluation Protocols at POEs

Location Code	Location Description	Sample Types/Frequencies	Analytes	Data Evaluation
GS10	South Walnut Creek at Outfall of FC-4	Continuous flow-paced composites; frequency varies (target is 20 per year)[a]	total hardness, Be, Cr, Pu, Am, and U isotopes[b]; dissolved Ag and Cd; [TSS[c]]	see Figure 6 in Appendix D
SW027	SID at Pond C-2	Continuous flow-paced composites; frequency varies (target is 20 per year)[a]	total hardness, Be, Cr, Pu, Am, and U isotopes[b]; dissolved Ag and Cd; [TSS[c]]	see Figure 6 in Appendix D
SW093	North Walnut Creek at Outfall of FC-3	Continuous flow-paced composites; frequency varies (target is 20 per year)[a]	total hardness, Be, Cr, Pu, Am, and U isotopes[b]; dissolved Ag and Cd; [TSS[c]]	see Figure 6 in Appendix D

Notes: [a]Frequency depends on available flow.
[b]U isotopes are U-233,234 + U-235 + U-238.
[c]Total suspended solids (TSS) is analyzed when the composite sampling period is within TSS hold-time limits.

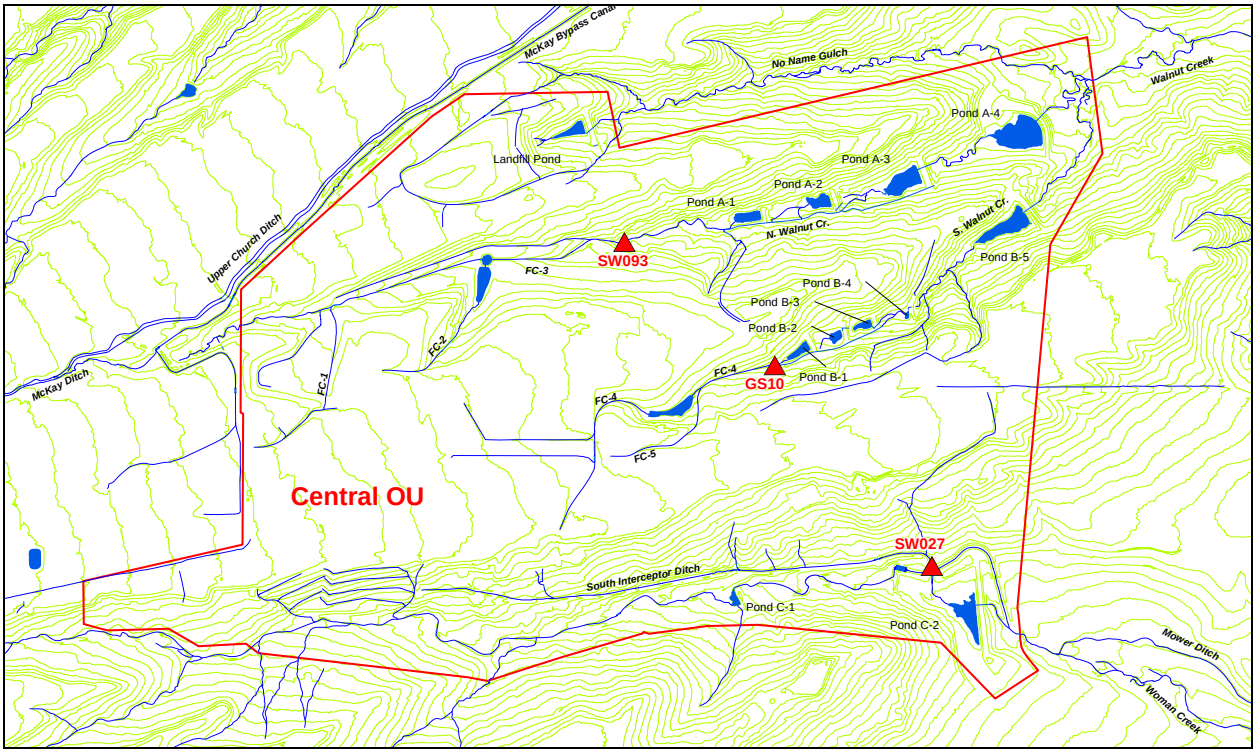


Figure 3-14. POE Monitoring Locations

The following sections include summary tables and plots showing the applicable 30-day and 12-month rolling averages for the POE analytes. The evaluations include all results that were not rejected through the verification and validation process. Data are generally presented to decimal places as reported by the laboratories. Accuracy should not be inferred; minimum detectable concentrations/activities and analytical error are often greater than the precision presented. When a sample has a corresponding field duplicate, the value used in calculations is the arithmetic average of the "real" and "duplicate" values. When a sample has multiple "real" analyses (Site-

requested "reruns"), the value used in calculations is the arithmetic average of the multiple "real" analyses.[4]

Refer to Appendix B, which contains the water-quality data, for further information.

Location GS10

Monitoring location GS10 is located on South Walnut Creek just upstream of the B-Series Ponds (Figure 3-14). The central portion of the COU contributes flow to GS10 through FC-4 and FC-5.

Table 3-9 shows that many of the annual average Pu and Am activities at GS10 were greater than 0.15 pCi/L during active Site closure. However, a significant reduction in both Pu and Am activities has been observed following Site closure. With the completion of the FCs, implementation of enhanced erosion controls, revegetation, soil stabilization, and lack of substantial runoff, transport of Pu and Am has been virtually eliminated. Figure 3-15 shows no reportable Pu or Am values during the year.

Table 3-9. Annual Volume-Weighted Average Radionuclide Activities at GS10 for 1997−2007

Calendar Year	Volume-Weighted Average Activity (pCi/L)		
	Am-241	Pu-239,240	Total U
1997	0.266	0.260	2.78
1998	0.109	0.158	3.06
1999	0.274	0.139	2.49
2000	0.421	0.195	2.23
2001	0.075	0.080	2.91
2002	0.087	0.061	2.88
2003	0.117	0.113	2.68
2004	0.136	0.314	2.48
2005	0.185	0.238	8.27
2006	0.010	0.014	13.43
2007	0.010	0.020	11.52
Total (1997−2007)	0.183	0.168	3.54

Figure 3-16 shows reportable 12-month rolling averages for total U during the year. Details regarding notification and source evaluation are contained in Section 2.2.1.1, "Notification and Source Evaluation for Reportable 12-Month Rolling Total U Values at RFCA Point of Evaluation GS10" of the *Quarterly Report of Site Surveillance and Maintenance Activities, Second Quarter Calendar Year 2006* (DOE 2006g). The Site continues to evaluate, in coordination with CDPHE, the measured U concentrations at GS10. Recent data are summarized below in a source evaluation update.

[4] Significant differences in values for a data pair are an indication of potential problems with sample preparation and/or analysis. Under these circumstances, an applicable value to be used for comparison cannot be determined with sufficient confidence to make compliance decisions. As such, an evaluation of the DER or RPD, depending on the analyte, is required to assess the representativeness of the sample and its usability for compliance decisions (see Section 8.2.3 of the RFSOG for discussion).

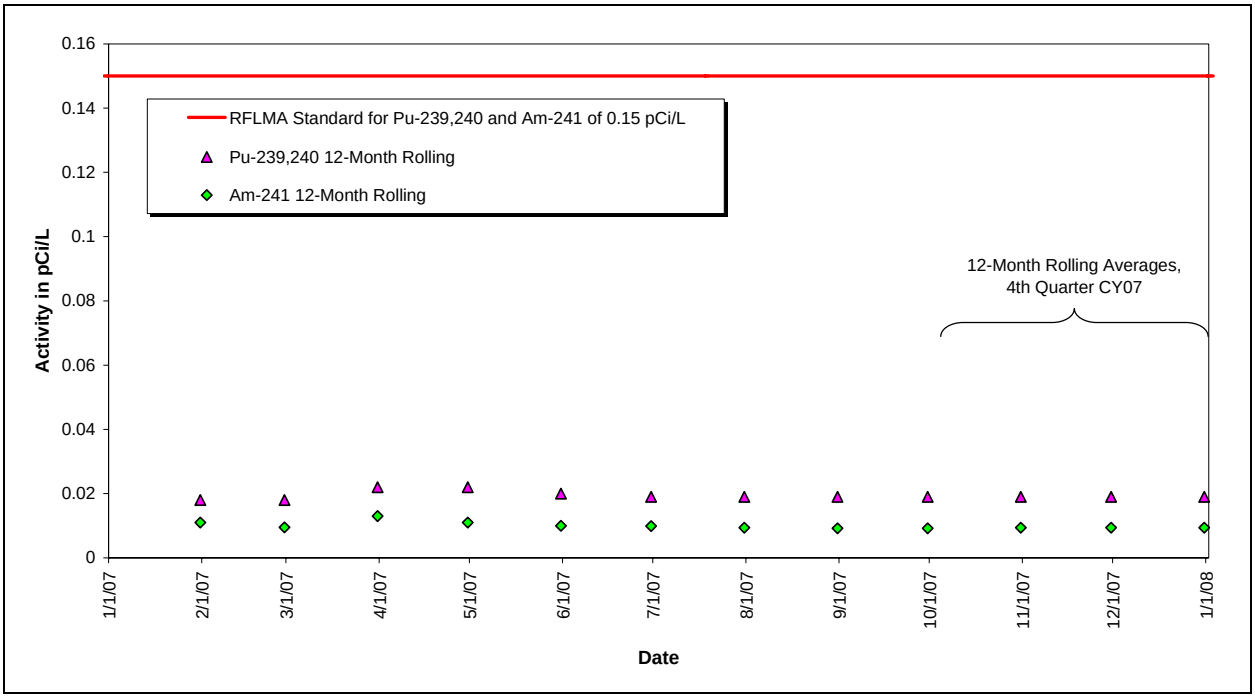


Figure 3-15. Volume-Weighted Average Pu and Am Compliance Values at GS10: Calendar Year Ending Fourth Quarter CY 2007

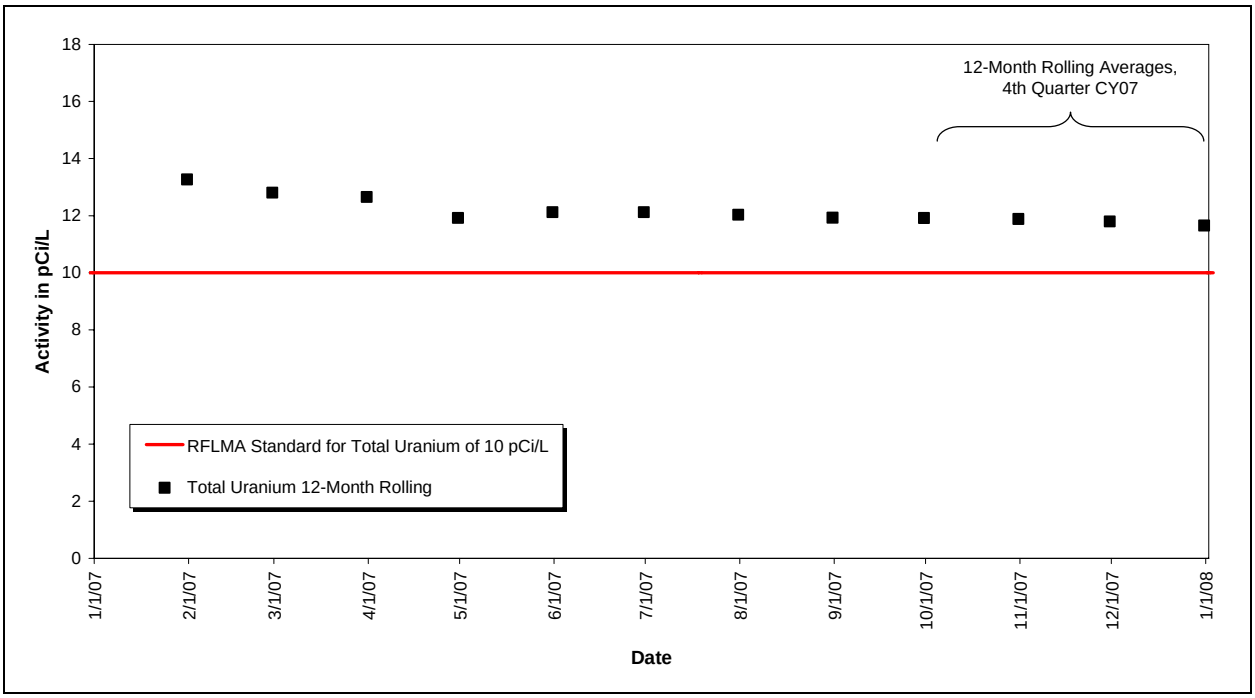


Figure 3-16. Volume-Weighted Average Total U Compliance Values at GS10: Calendar Year Ending Fourth Quarter CY 2007

Table 3-10 shows that all of the annual average metals concentrations were less than the standards/PQLs. Additionally, the long-term metals averages (1997−2007) were all less than the RFLMA standards/PQLs. Figure 3-17 shows that none of the 85th percentile 30-day average metals concentrations were reportable for the year.

Table 3-10. Annual Volume-Weighted Average Hardness and Metals Concentrations at GS10 for 1997−2007

Calendar Year	Volume-Weighted Average Concentration (µg/L)				
	Hardness (mg/L)	Total Be	Dissolved Cd	Total Cr	Dissolved Ag
1997	138	0.50	0.09	4.05	0.11
1998	162	0.15	0.13	3.32	0.20
1999	139	0.16	0.07	4.08	0.15
2000	181	0.21	0.11	3.65	0.11
2001	222	0.32	0.11	5.95	0.11
2002	277	0.24	0.09	5.38	0.10
2003	228	0.22	0.10	6.91	0.12
2004	227	0.60	0.10	13.1	0.13
2005	401	0.88	0.06	17.5	0.15
2006	604	0.50	0.05	0.74	0.10
2007	383	0.50	0.10	0.89	0.10
Total (1997−2007)	214	0.35	0.10	6.14	0.13

Notes: Hardness units in mg/L.

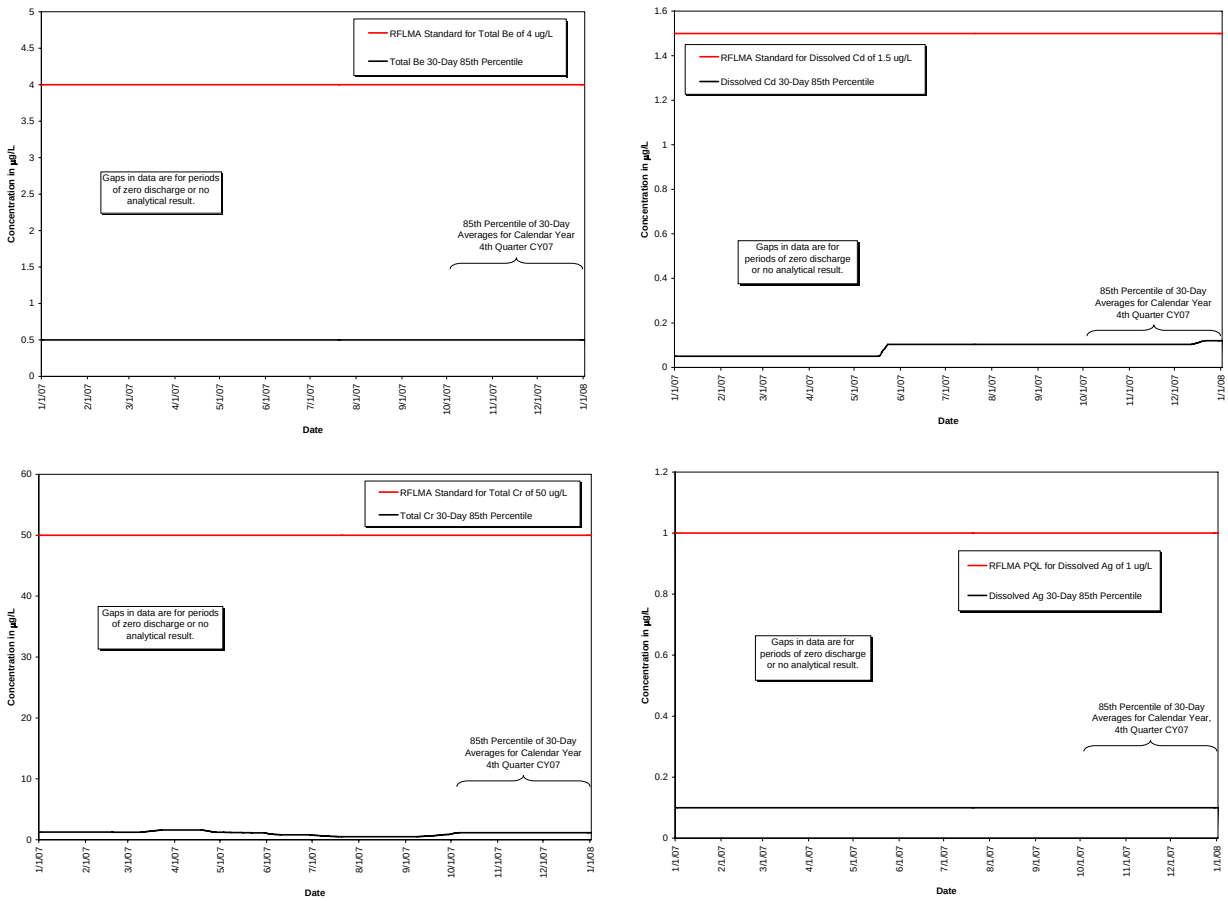


Figure 3-17. Volume-Weighted Average Metals Compliance Values at GS10: Calendar Year Ending Fourth Quarter CY 2007

Summary of Recent Reportable 12-Month Rolling Total U Values at POE GS10

This section provides follow-up information regarding the Site's July 13, 2006, notification of observed reportable concentrations of U in surface water at RFCA POE surface-water monitoring location GS10, which is located in South Walnut Creek upstream of Pond B-1 (Figure 3-1). Reportable U levels continue to be observed at GS10. The Site continues to evaluate, in coordination with CDPHE, the measured U concentrations at GS10. Note that this section includes the most recent data available; these data extend beyond the end of CY 2007.

DOE first became aware of the reportable 12-month rolling averages when all U sample results were validated on July 6, 2006. To meet the RFCA commitment at the time, DOE transmitted notification to EPA and CDPHE within the 15-day reporting period, which ended July 21, 2006. In addition, RFCA required that DOE, within 30 days of gaining knowledge of the reportable results, submit to EPA and CDPHE a source evaluation plan addressing reportable values. The July 13, 2006, notification letter served as both the comprehensive notice and the plan for that source evaluation, based on consideration for other evaluative work already performed in this drainage.

The characteristics of the current reportable period for U at GS10 are consistent with those for the previous reportable period during the summer of 2005. DOE provided notice for that reportable period on August 16, 2005 (05-DOE-00522).

The calculated 12-month rolling average for total U triggered the reporting requirements under RFCA Attachment 5, Section 2.4 (B) and subsequently Section 6.0 of Attachment 2 to RFLMA, beginning April 30, 2006, and not ended as of the end of 2007 (for details, see Table 3-11). All data used in the calculation of the 12-month rolling average have been validated. The end of the reportable period will be determined by subsequent data. Recent analytical results are listed in Table 3-12.

Table 3-11. Reportable 12-Month Rolling Average Values for POE Monitoring Location GS10

Analyte	Dates of Reportable Values	Range of 12-Month Rolling Average Values (pCi/L)
Total U	4/30/06−to be determined	10.19−13.41

Note: The standard for total U in Walnut Creek is 10 pCi/L.

Table 3-12. Recent Analytical Results for Composite Samples Collected at GS10

Composite Sample Start Date	Total U Analytical Result (pCi/L)
2/8/2007	13.82
3/2/2007	12.14
3/25/2007	17.31
4/17/2007	14.92
4/24/2007	8.46
4/25/2007	13.18
5/1/2007	15.12
5/10/2007	12.79
5/24/2007	12.83
5/31/2007	11.45
7/5/2007	6.88
7/23/2007	6.74
8/6/2007	6.56
8/21/2007	6.52
9/6/2007	6.15
10/1/2007	7.87
10/16/2007	10.98
11/1/2007	10.60
11/20/2007	13.24

Note: NSQ = nonsufficient quantity; this sample was not analyzed due to faulty automated sampling due to winter icing conditions.

The following evaluation for South Walnut Creek monitoring station GS10 covers data received through April 9, 2008. Laboratory analyses for the composite sample collected for the period February 12−March 18, 2008, have not been completed. The composite sample started on March 18, 2008, is still in progress. The following are included in this assessment:

- Evaluation of ongoing automated surface-water monitoring at GS10;
- Estimation of U loads at GS10; and
- Evaluation of water-quality trends and correlations at GS10.

Downstream Water-Quality Monitoring

Water flowing through GS10 also passes through the lower B-Series Ponds (Ponds B-4 and B-5) and South Walnut Creek before leaving the Site. POCs GS08 (Pond B-5 outlet) and GS03 (Walnut Creek at Indiana Street) again monitor this water during Pond B-5 discharges.

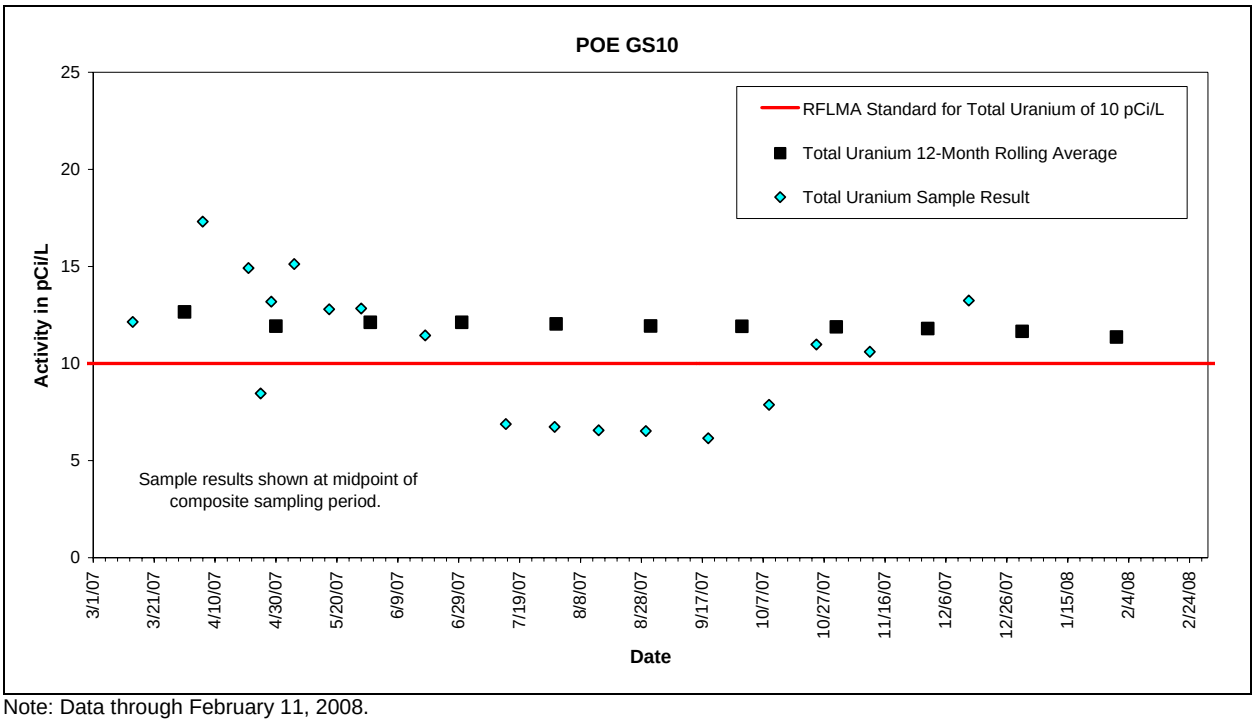
Pond B-5 was pre-discharge sampled on February 28, 2007. The total U concentration for that sample was 7.82 pCi/L. Pond B-5 was direct-discharged through the outlet to South Walnut Creek through POC GS08 starting on March 1, 2007, and ending on March 13, 2007. During the discharge period, six composite samples were collected at both POC GS08 and POC GS03. Total U concentrations in the GS08 samples ranged from 11.1 to 9.36 pCi/L. The 12-month rolling average at GS08 for March 31, 2007, was 9.99 pCi/L, just below the standard. Total U results at GS03 during the discharge ranged from 6.38 to 4.38 pCi/L; the highest 30-day average resulting from the discharge was 5.35 pCi/L.[5]

Pond B-5 was again pre-discharge sampled on May 4, 2007. Total U results for this sample (Site results) were significantly different than CDPHE results from the split sample. Based on the discrepancy, the decision was made to resample Pond B-5 for total U; samples were collected on June 7, 2007. The total U concentration for the June 7, 2007, sample was 7.8 µg/L (approximately 5.35 pCi/L). Based on that result, Pond B-5 was direct-discharged through the outlet to South Walnut Creek through POC GS08 starting on July 5, 2007, and ending on July 12, 2007. During the Pond B-5 discharge period, two composite samples were collected at POC GS08 and three composite samples were collected at POC GS03. Total U concentrations in the GS08 samples were 4.29 and 4.87 pCi/L. The 12-month rolling average at GS08 for July 31, 2007, was 8.39 pCi/L. Total U results at GS03 during the Pond B-5 discharge ranged from 3.47 to 3.99 pCi/L; the highest 30-day average at GS03 during the discharge was 2.17 pCi/L.[6] Pond B-5 has not been discharged since July 2007.

GS10 Monitoring Results

As specified in RFLMA, the Site demonstrates compliance using 12-month rolling average values for select radionuclides at POE surface-water monitoring locations. Results for recent 12-month rolling average values using available data at GS10 are summarized in Table 3-11. Figure 3-18 shows the calculated compliance values and the individual sample results at GS10 for the previous CY period.

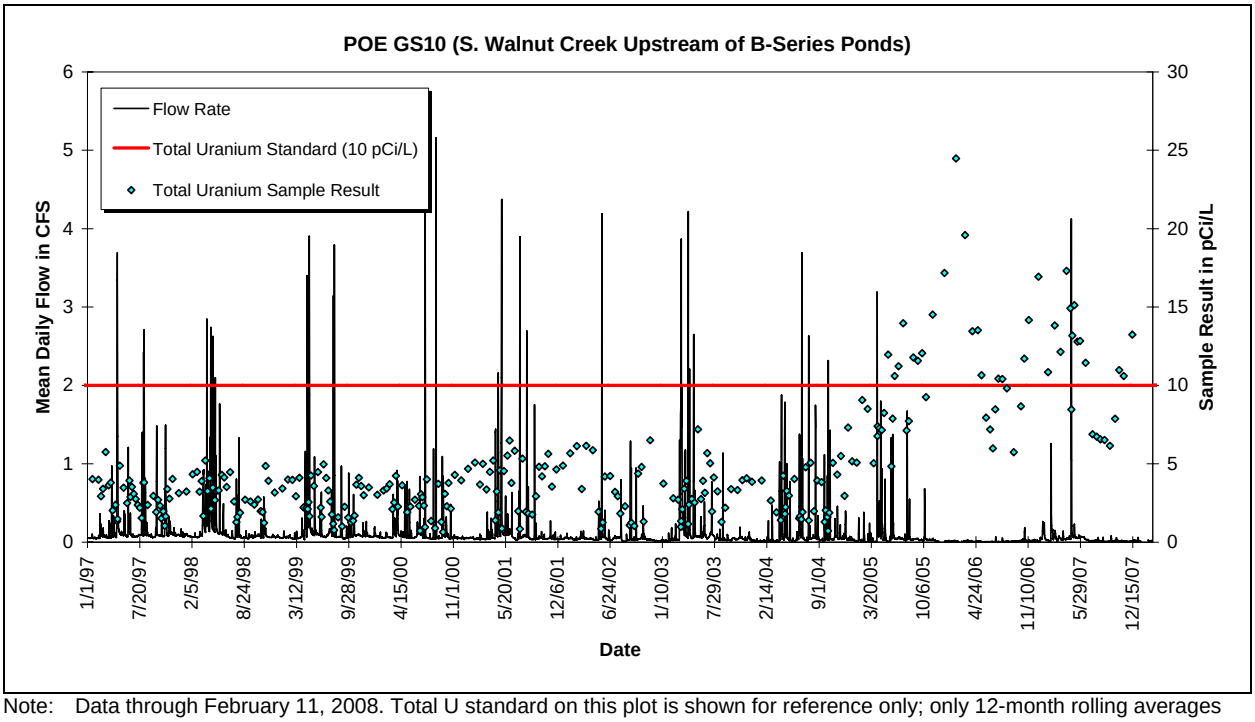
[5] Pond A-4 was concurrently discharged with Pond B-5 in March 2007; samples collected at GS03 included commingled water from both ponds.
[6] Pond A-4 was also concurrently discharged with Pond B-5 in July 2007; samples collected at GS03 included commingled water from both ponds.



Note: Data through February 11, 2008.

Figure 3-18. POE Monitoring Station GS10: Compliance Values and Individual Sample Results for Total U (March 1, 2007−March 1, 2008)

All analytical results for the composite samples collected during the period of reportable values have been validated through February 11, 2008. A review of historical GS10 monitoring data shows that these results are measurably higher than those for previous years (Figure 3-19). The significant reduction in runoff following Site closure can also be clearly seen on Figure 3-19.



Note: Data through February 11, 2008. Total U standard on this plot is shown for reference only; only 12-month rolling averages are compared to the standard.

Figure 3-19. POE Monitoring Station GS10: Hydrograph and Individual Sample Results for Total U (January 1, 1997−March 1, 2008)

Data Summary and Analysis

Monitoring data were extracted from the former Soil Water Database or the current Site Environmental Evaluation for Projects (SEEPro) database. The following list describes the environmental data compilation process:

- Individual sample result values are calculated as arithmetic averages of real and field duplicate results when both results are from the same sampling event;[7]
- When available, Site-requested laboratory reruns are averaged with initial runs for the same sampling event;
- Laboratory duplicate and replicate quality control (QC) results are not used;
- When negative values for actinide measurement are returned from the laboratories due to blank correction, 0.0 pCi/L is used in the calculations;
- Only total radionuclide measurements are used; and
- Data that did not pass validation (rejected data) are not used.

[7] Radionuclide data pairs are averaged when the DER is less than 1.5; sample pairs with DER ratios in excess of 1.5 are not used due to inferred lack of confidence in either result.

Verification and Validation of Surface-Water Analytical Results

Prior to Site closure, all surface-water isotopic data are either verified or validated, based on criteria determined by the Kaiser-Hill Company, LLC (K-H) Analytical Services Division, or at the special request of the requestor. Approximately 75 percent of all isotopic data are verified and the remaining 25 percent are validated. Validation is typically determined randomly for each subcontracted laboratory, based on the specific analytical suites. This random validation selection may or may not routinely include POE or POC locations. However, when reportable values are observed, all analytical results used in the calculations receive formal validation.

Under current LM procedures, all data are validated prior to being loaded into the SEEPro database.

High-Resolution Inductively Coupled Plasma/Mass Spectrometry and Thermal Ionization Mass Spectrometry Analyses

Prior to Site closure, groundwater and surface-water samples from select locations were sent to LANL for high-resolution inductively coupled plasma/mass spectrometry (HR ICP/MS) and/or thermal ionization mass spectrometry (TIMS) analyses. These analytical methods measure mass ratios of four U isotopes (masses 234, 235, 236, and 238). Isotopic ratios provide a signature that indicates whether and the extent to which the source of U is natural or anthropogenic (manmade).

In August 2005, South Walnut Creek surface-water samples from SW056, SW141, and GS10, and groundwater samples from upgradient wells 91305, 99305, 91203, and 99405 were evaluated using HR ICP/MS and TIMS. The results indicate that, although concentrations of U vary widely, all the groundwater and surface-water locations produce water samples with a predominantly natural U isotopic signature. Location GS10, however, displayed a higher percentage of anthropogenic U than the other locations. Concentrations of U in groundwater samples collected in August 2005 from wells located upstream of GS10 vary from less than 5 µg/L at well 91203 (with a 93.4 percent natural U isotopic signature) to nearly 400 µg/L at well 99405 (with an isotopic signature that is 99.9 percent natural U). (A previous sample from the original well at this location, 99401, contained just over 650 µg/L U that was 100 percent natural.)

The results of all the HR ICP/MS and TIMS analyses are summarized in a report titled *Quantitative Evaluation of Mixture Components in RFETS Uranium Isotopic Analyses: Development & Verification/Validation of Calculations using an Excel Spreadsheet* by Dr. David R. Janecky, LANL (Janecky 2006; included as Attachment 3 to Section 8 of the Remedial Investigation/Feasibility Study (RI/FS) Report published in June 2006). This report provides a summary of the HR ICP/MS and TIMS results and calculations of U isotopic mixtures (mixtures between natural and anthropogenic [enriched and depleted] U). Dr. Janecky's analysis concludes that the U at GS10 is dominated by natural U, with a lesser amount of depleted and minimal enriched U. An earlier sample analyzed by LANL, collected in May 2002, shows a generally similar isotopic signature, although the relative fraction of anthropogenic U is smaller.

The Site recently submitted additional samples collected in 2007 to LANL for high-resolution isotopic analyses. Results for GS10 LANL analysis are provided in Table 3-13. Table 3-14 lists the locations of the 2007 LANL samples. Results from LANL analyses are summarized in the

report titled *Thermal Ionization Mass Spectrometry Uranium Results for October 2007 RFETS Waters* (Janecky et al. 2007), provided in Appendix E.

Table 3-13. U Concentrations and Isotopic Signatures from Samples Collected at GS10 as Reported by LANL

Date	U Concentration, µg/L	% Depleted U	% Enriched U	% Natural U
5/1/2002	9.4	22.1	0.04	77.8
8/11/2005	13.2	36.2	0.10	63.7
7/23/2007[a]	10.0	29.2	0.10	70.7

Source: Data are from RI/FS Section 8, Attachment 3, and the most recent LANL report; data have been normalized to 100 percent.
[a]This sample included a duplicate analysis; data shown are arithmetic averages.

Table 3-14. Locations Selected for Sampling and High-Resolution U Analysis

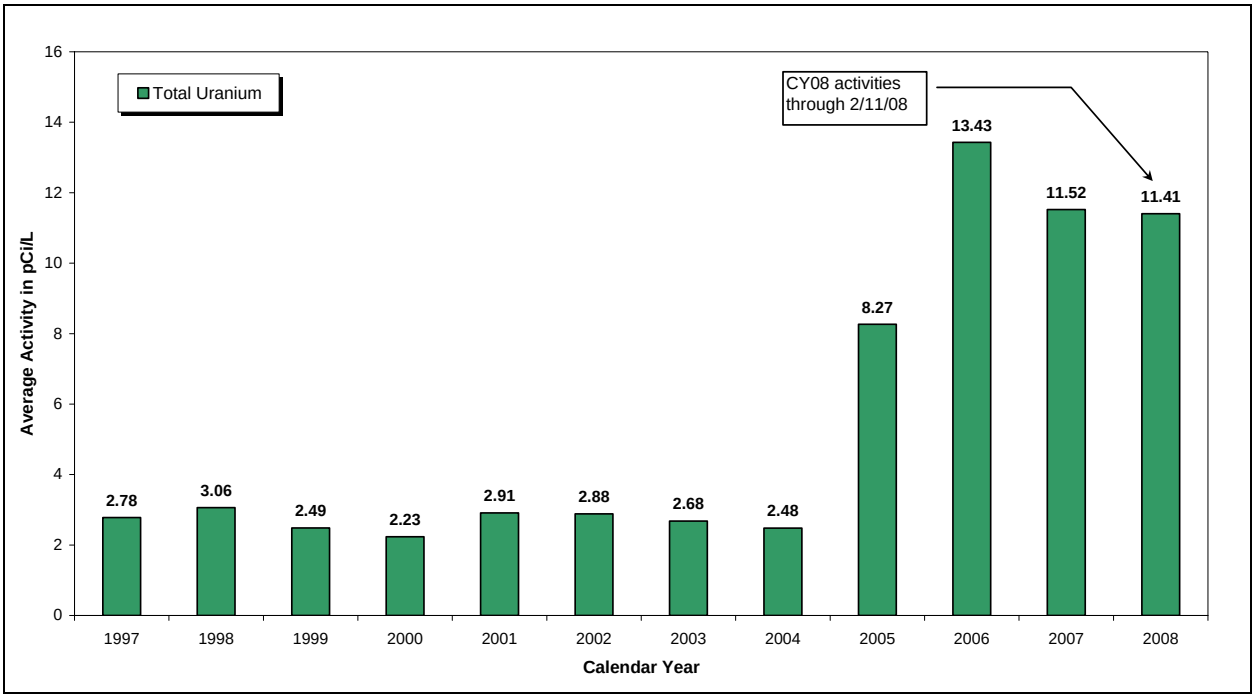
Sample Location	Sample Date - Time	General Area
Well 80205	9/7/2007 8:28	Downgradient OLF
Well 10594	9/11/2007 14:29	North Walnut Creek downgradient of SPP
Well 99405	9/12/2007 12:00	South Walnut Creek near former B991
GS03	7/9/2007 16:50	Walnut Creek at Indiana Street
SPP Discharge Gallery	9/12/2007 11:35	North Walnut Creek above Pond A-1
GS10	7/23/2007 12:00	South Walnut Creek

The samples from GS10 summarized in Table 3-13 illustrate the isotopic variability of the mixture of direct runoff and groundwater that contributes to surface-water flow at this location. Over longer periods, this variability may have a greater influence on the concentration and signature characteristics of the U in surface water.

Total U at GS10: Data Summary

Figure 3-20 shows the volume-weighted average annual activity-concentrations (concentration in surface water expressed as activity per unit volume) for total U at GS10 during CY 1997−2007 and a portion of 2008. A measurable increase in concentration is noted starting in 2005.

Annual total U loads (mass) for GS10 in grams are plotted on Figure 3-21 to show long-term loading at GS10. The activity-concentration for each flow-paced composite sample is multiplied by the associated discharge volume to get picocuries (pCi), then converted to grams and totaled annually. Although reportable compliance values were observed during the 2005−2008 period shown, and concentrations in Figure 3-20 show a measurable increase, the loads for the 2005−2008 period shown are closer to historical ranges, and measurably lower in CY 2006. This further suggests that the recently observed increased U concentrations at GS10 may be a result of changing hydrologic conditions, and not significant increases in the quantity of U reaching the creek.



Note: Data through February 11, 2008.

Figure 3-20. Average Annual Total U Concentrations at GS10: 1997−2008

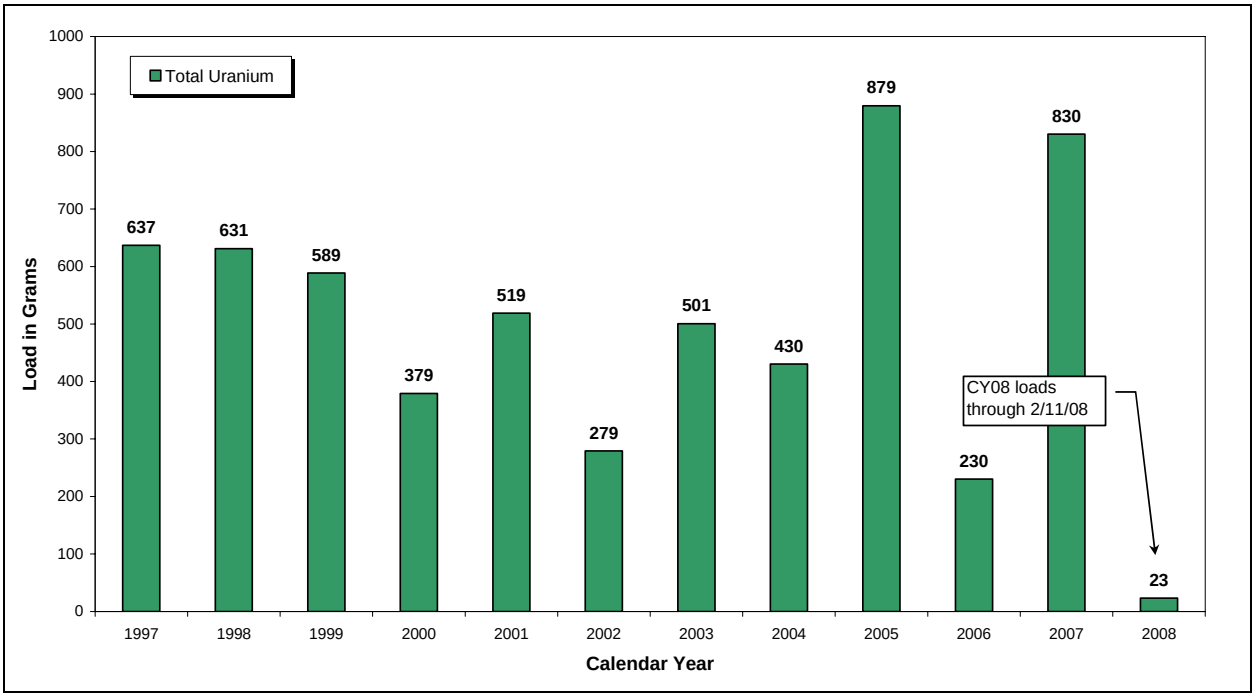


Figure 3-21. Annual Total U Loads at GS10: 1997−2008

Figure 3-22 shows that the higher U concentrations are generally associated with lower flow rates, during periods of extended baseflow sustained by groundwater contributions.[8] As the area of impervious surfaces in the GS10 drainage was reduced by Site closure (i.e., removal of buildings, asphalt, and concrete), direct runoff to GS10 was also reduced. Similarly, removal of Site infrastructure likely resulted in reduced baseflow contributions from domestic and sanitary water leakage.[9] Therefore, groundwater contributions to the creek over the same period comprised an increasing portion of the flows monitored at GS10. Groundwater data from monitoring wells located near South Walnut Creek show naturally occurring U in concentrations that are considerably higher than the surface-water standard. Without the attenuation of U from groundwater sources by direct runoff and infrastructure leakage, increases in surface water U concentrations would be expected.

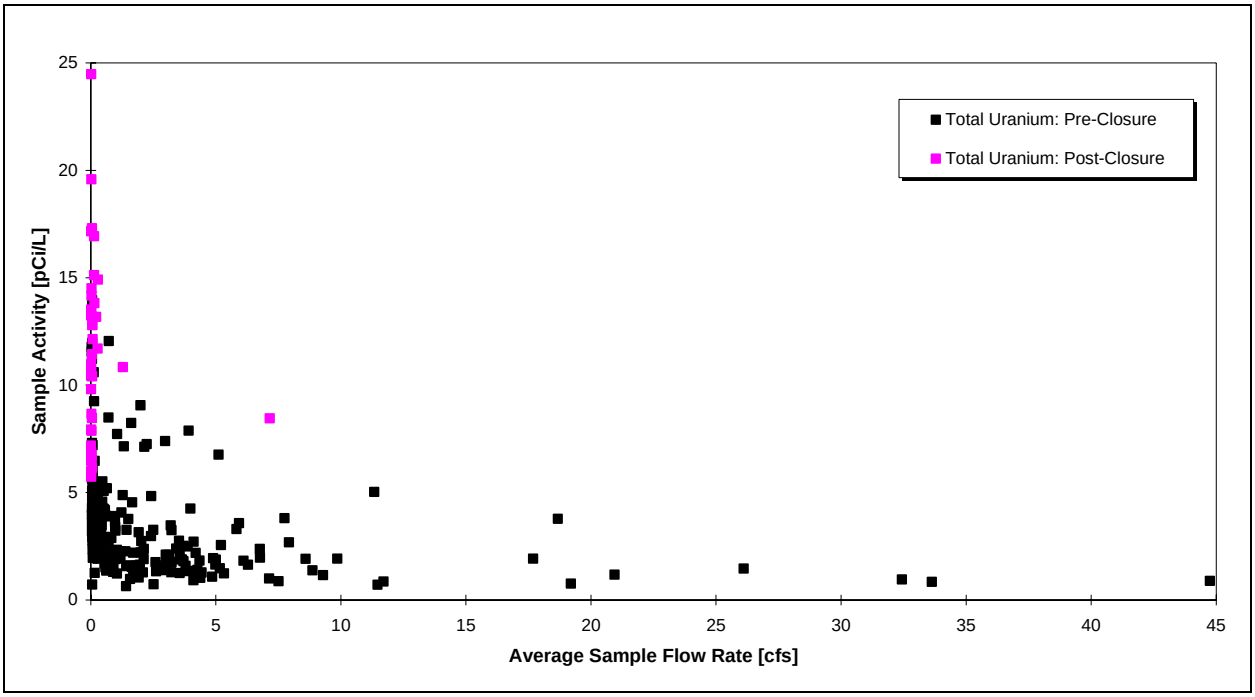


Figure 3-22. Variation of Total U Concentration with Flow Rate at GS10: 1997−2007 and Portion of 2008

Hardness is measured for all composite samples at GS10 to support metals evaluation. Figure 3-23 shows individual sample results for hardness plotted with flow rate. A measurable increase in hardness is noted during the recent period of reduced flow rates and increased U concentrations (see Figure 3-19). In contrast, the measurably higher hardness concentrations starting in 2001 have been attributed to changes in the deicing products used at Rocky Flats starting with the winter of 2000−2001. Since groundwater generally shows higher hardness than surface-water runoff, these data further suggest an increase in the proportion of groundwater in flows at GS10.

[8] These groundwater contributions occur as localized or distributed seeps to the streambed.
[9] Leaks from domestic and sanitary utility lines are presumed to have lower U concentrations than natural groundwater sources.

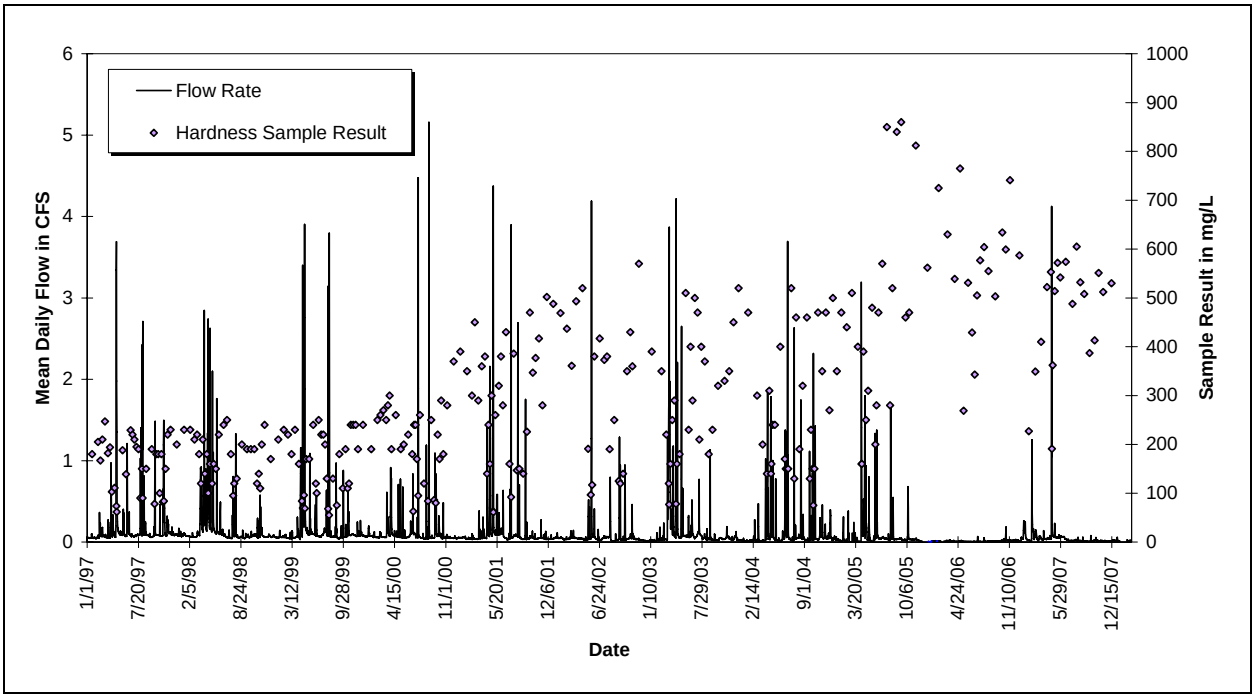


Figure 3-23. POE Monitoring Station GS10: Hydrograph and Individual Sample Results for Hardness (January 1, 1997−February 11, 2008)

Summary and Conclusions

Based on the above evaluation, Site personnel conclude that the recent U activities at GS10 are likely a result of changing hydrologic conditions (particularly the increasing groundwater component in surface-water flows at GS10, relative to conditions that prevailed prior to Site closure), and that no specific remedial action(s) is indicated at this time. The data do not suggest a previously unknown localized source(s) of contamination that warrants targeted remediation. The current conclusions are summarized below:

- Data collected from all terminal pond and fenceline POCs remain below reporting thresholds for all monitored analytes. However, increased U concentrations are being observed downstream of GS10.
- Past HR ICP/MS and TIMS analyses for both groundwater and surface-water samples collected upstream of GS10 all show a predominantly natural U signature (Janecky 2006, Janecky et al. 2007). While the four analyses[10] of surface water from GS10 indicate the existence of some anthropogenic U[11], the normal variability of direct runoff and groundwater flow would be expected to strongly influence the U characteristics, both concentration and signature, over longer periods. To fully understand this variability, additional U data as they relate to the appropriate water-quality standard continue to be evaluated.
- Groundwater data within South Walnut Creek show naturally occurring U activities considerably higher than the surface-water standard. Baseflow at GS10 is sustained by

[10] Three LANL samples have been collected at GS10: May 1, 2002, August 11, 2005, and July 23, 2007. The July 23, 2007, sample includes a duplicate analysis.
[11] GS10 continues to show a predominantly natural uranium signature.

groundwater expressions in the form of both localized seeps and distributed flow to the streambed.

- Surface-water data from GS10 generally show that the higher U concentrations are associated with lower flow rates, during periods of extended baseflow sustained by groundwater contributions. As the amount of impervious surface at the Site was reduced, direct runoff to GS10 was also reduced. Similarly, removal of Site infrastructure likely resulted in reduced baseflow contributions from domestic and sanitary water leakage. Therefore, groundwater contributions to South Walnut Creek now make up a larger portion of the flows monitored at GS10. Without the attenuation of U groundwater sources by direct runoff and infrastructure leakage, increases in surface-water U concentrations would be expected.

Location SW027

Monitoring location SW027 is located at the end of the SID at the inlet to Pond C-2 (Figure 3-14). The southern portion of the COU contributes flow to SW027 through the SID.

Table 3-15 shows that the majority of the annual average Pu and Am activities are less than 0.15 pCi/L. The significant increase in 2004 was the result of increased solids transport from disturbed areas associated with the 903 Pad/Lip accelerated actions. However, a significant reduction in both Pu and Am activities has been observed following completion of accelerated actions in the drainage. With the completion of the 903 Pad/Lip actions, implementation of enhanced erosion controls, revegetation, soil stabilization, and lack of substantial runoff, transport of Pu and Am approaching the action level has been virtually eliminated. The total U annual average activities are well below 11 pCi/L.

Table 3-15. Annual Volume-Weighted Average Radionuclide Activities at SW027 for 1997−2007

Calendar Year	Volume-Weighted Average Activity (pCi/L)		
	Am-241	Pu-239,240	Total U
1997	0.008	0.036	1.48
1998	0.021	0.156	3.45
1999	0.019	0.066	1.90
2000	0.060	0.348	1.10
2001	0.006	0.025	1.33
2002	0.001	0.003	0.53
2003	0.011	0.080	1.70
2004	0.413	2.273	1.05
2005	0.022	0.156	2.34
2006	NA (no flow)	NA (no flow)	NA (no flow)
2007	0.040	0.092	2.04
Total (1997−2007)	0.058	0.318	1.84

Note: NA = not applicable.

Figure 3-24 and Figure 3-25 display the volume-weighted average Pu and Am and total U compliance values at SW027 for CY 2007, respectively.

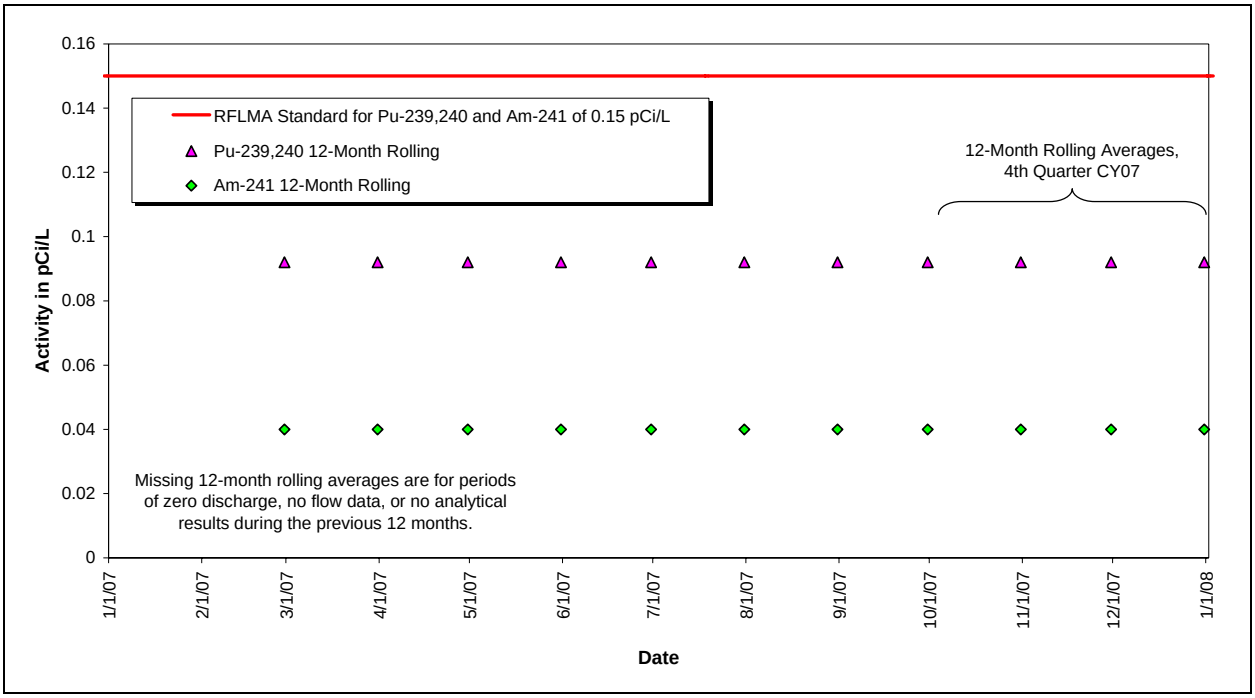


Figure 3-24. Volume-Weighted Average Pu and Am Compliance Values at SW027: Calendar Year Ending Fourth Quarter CY 2007

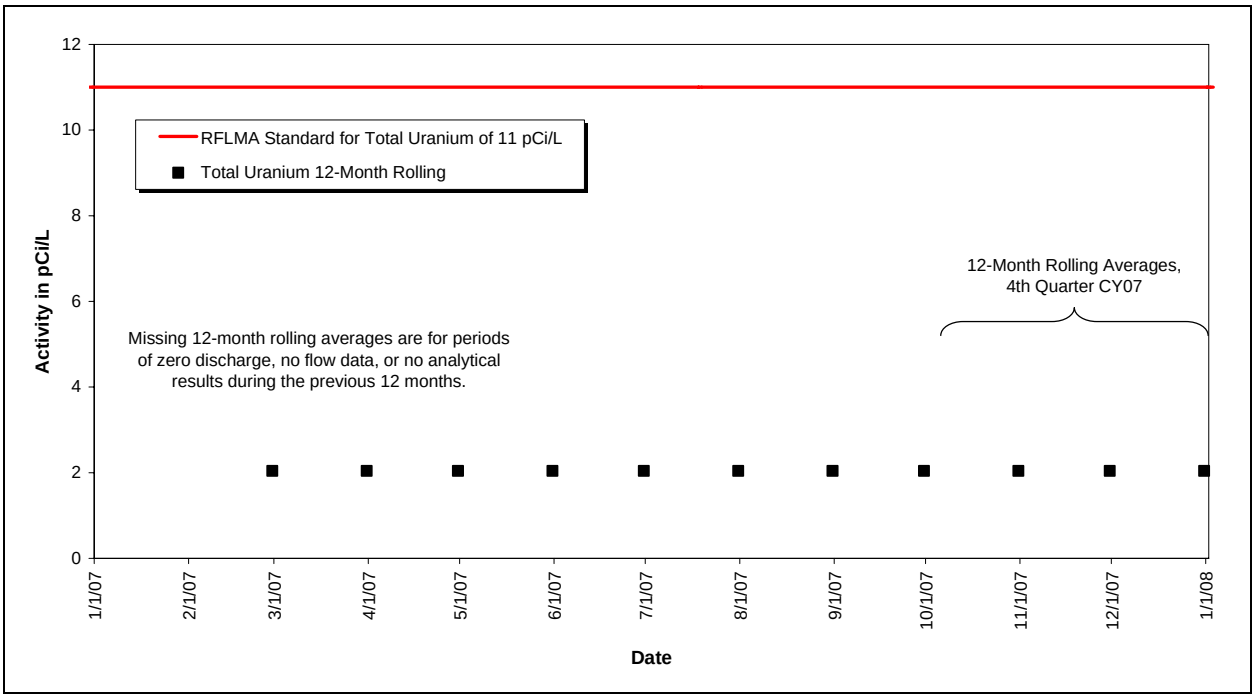


Figure 3-25. Volume-Weighted Average Total U Compliance Values at SW027: Calendar Year Ending Fourth Quarter CY 2007

Table 3-16 shows that all of the annual average metals concentrations are less than the standards. Additionally, the long-term metals averages (1997−2007) are less than the standards.

Table 3-16. Annual Volume-Weighted Average Hardness and Metals Concentrations at SW027 for 1997−2007

Calendar Year	Volume-Weighted Average Concentration (µg/L)				
	Hardness (mg/L)	Total Be	Dissolved Cd	Total Cr	Dissolved Ag
1997	112	0.44	0.09	1.71	0.10
1998	152	0.14	0.15	0.91	0.21
1999	111	0.03	0.10	1.55	0.24
2000	150	0.27	0.05	4.14	0.09
2001	145	0.23	0.07	1.82	0.12
2002	114	0.12	0.05	2.88	0.11
2003	148	0.06	0.06	1.75	0.15
2004	133	0.32	0.06	7.36	0.19
2005	236	0.08	0.07	2.03	0.19
2006	NA (no flow)	NA (no flow)	NA (no flow)	NA (no flow)	NA (no flow)
2007	133	0.50	0.05	0.50	0.10
Total (1997−2007)	138	0.21	0.08	2.28	0.16

Notes: Hardness units in mg/L.
NA = not applicable.

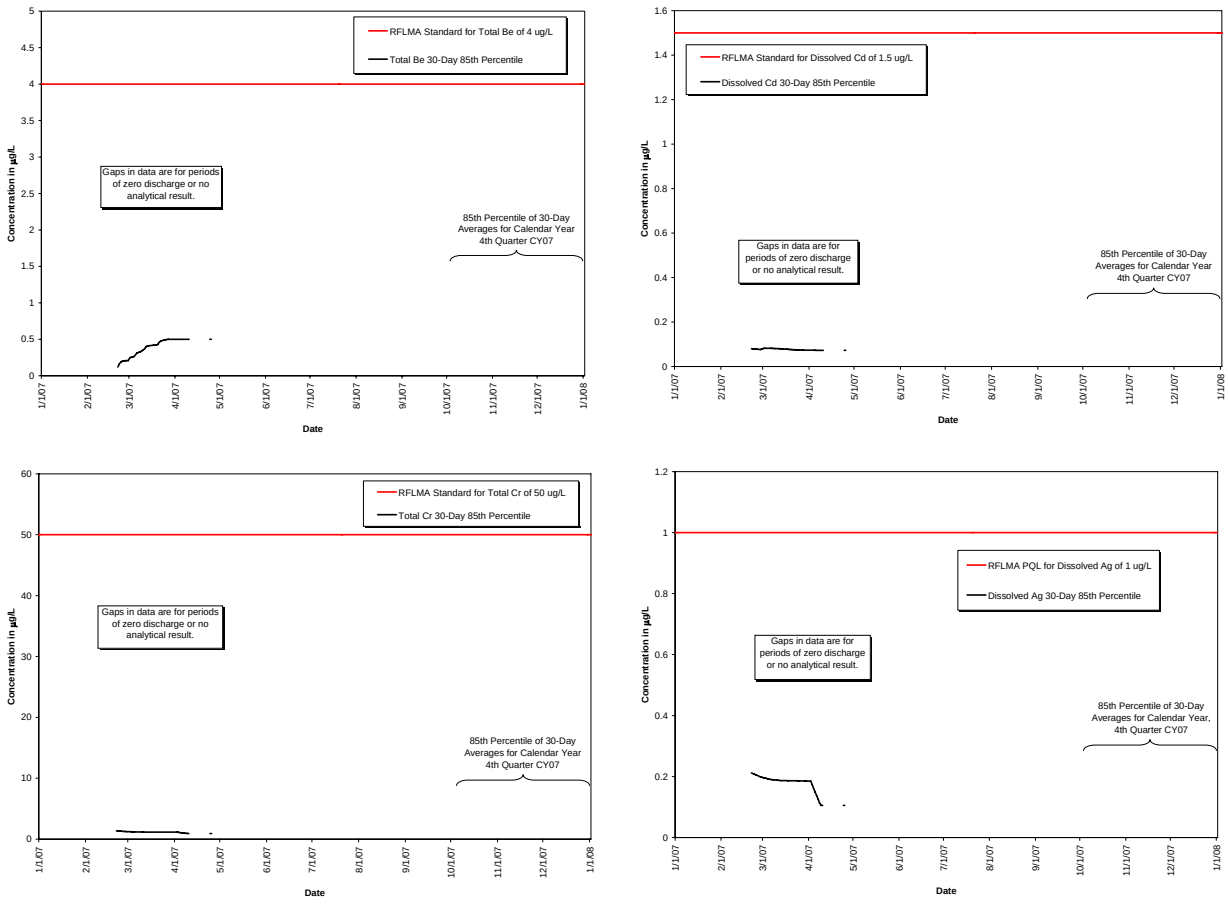


Figure 3-26. Volume-Weighted Average Metals Compliance Values at SW027: Calendar Year Ending Fourth Quarter CY 2007

Location SW093

Monitoring location SW093 is located on North Walnut Creek 1,300 feet upstream of the A-Series Ponds (Figure 3-14). The northern portion of the COU contributes flow to SW093 through FC-2 and FC-3.

Table 3-17 shows that the majority of the annual average Pu and Am activities are below 0.15 pCi/L. Additionally, the long-term Pu and Am averages (1997−2007) are below 0.15 pCi/L. The average total U activities are all well below 10 pCi/L.

Table 3-17 indicates an increase in Pu and Am activities during 2004. However, a significant reduction in both Pu and Am activities has been observed following Site closure. With the completion of the FCs, implementation of enhanced erosion controls, revegetation, soil stabilization, and lack of substantial runoff, transport of Pu and Am has been virtually eliminated. Figure 3-27 and Figure 3-28 show no reportable Pu, Am, or total U values during the year.

Table 3-17. Annual Volume-Weighted Average Radionuclide Activities at SW093 for 1997−2007

Calendar Year	Volume-Weighted Average Activity (pCi/L)		
	Am-241	Pu-239,240	Total U
1997	0.035	0.052	2.38
1998	0.020	0.022	2.26
1999	0.025	0.038	1.95
2000	0.022	0.040	2.06
2001	0.011	0.015	2.14
2002	0.017	0.006	2.67
2003	0.039	0.056	2.34
2004	0.622	0.603	2.50
2005	0.029	0.022	3.97
2006	0.004	0.008	5.93
2007	0.009	0.011	3.78
Total (1997−2007)	0.078	0.084	2.50

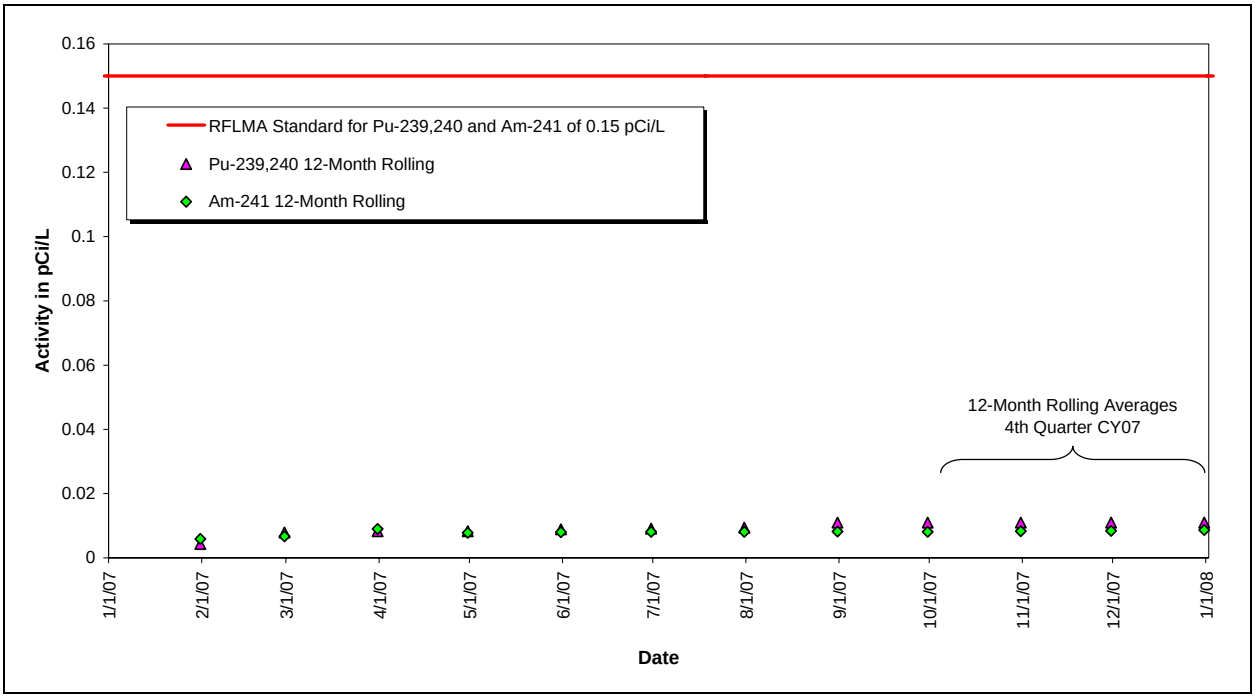


Figure 3-27. Volume-Weighted Average Pu and Am Compliance Values at SW093: Calendar Year Ending Fourth Quarter CY 2007

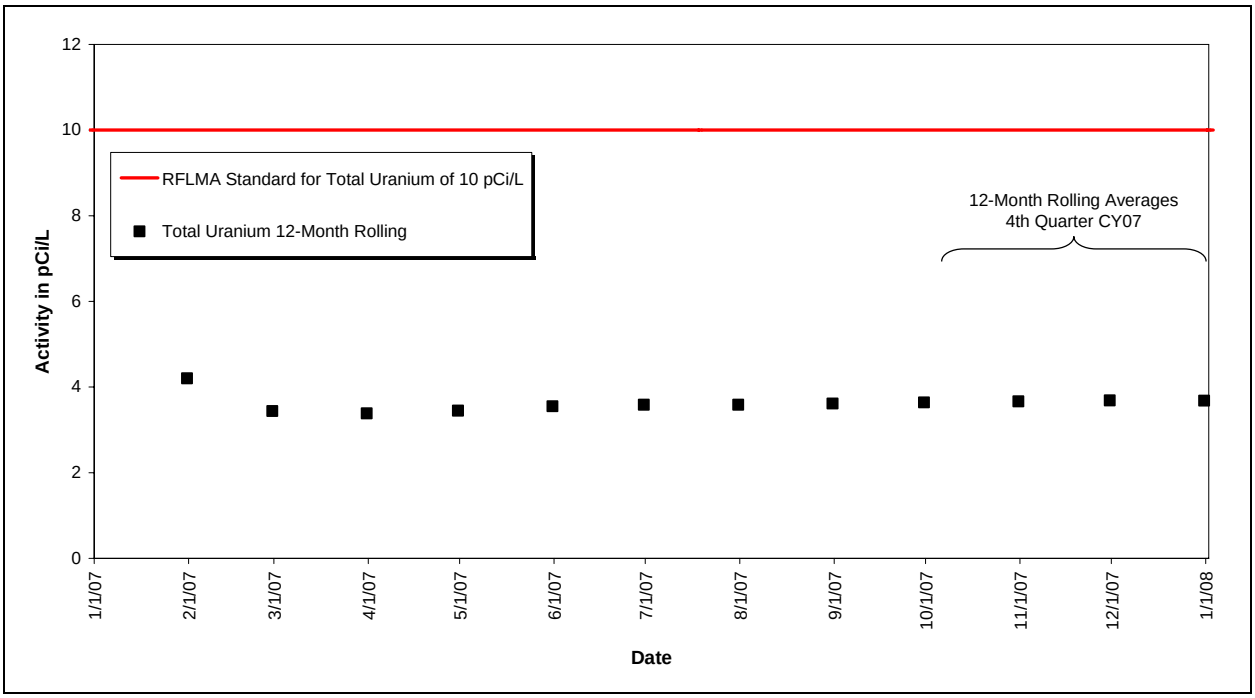


Figure 3-28. Volume-Weighted Average Total U Compliance Values at SW093: Calendar Year Ending Fourth Quarter CY 2007

Table 3-18 shows that all of the annual average metals concentrations are less than the standards. Additionally, the long-term metals averages (1997−2007) are less than the standards. Figure 3-29 shows that none of the 85th percentile 30-day average metals concentrations were reportable for the year.

Table 3-18. Annual Volume-Weighted Average Hardness and Metals Concentrations at SW093 for 1997−2007

Calendar Year	Volume-Weighted Average Concentration (µg/L)				
	Hardness (mg/L)	Total Be	Dissolved Cd	Total Cr	Dissolved Ag
1997	168	0.43	0.07	2.36	0.12
1998	184	0.14	0.23	2.22	0.22
1999	152	0.20	0.13	5.08	0.16
2000	231	0.21	0.08	3.94	0.11
2001	247	0.36	0.07	6.49	0.11
2002	365	0.30	0.08	5.95	0.11
2003	257	0.29	0.09	6.88	0.16
2004	315	0.57	0.09	12.05	0.12
2005	337	0.11	0.05	1.92	0.11
2006	564	0.50	0.05	0.82	0.10
2007	287	0.50	0.06	0.82	0.10
Total (1997−2007)	240	0.31	0.10	4.79	0.14

Note: Hardness units in mg/L.

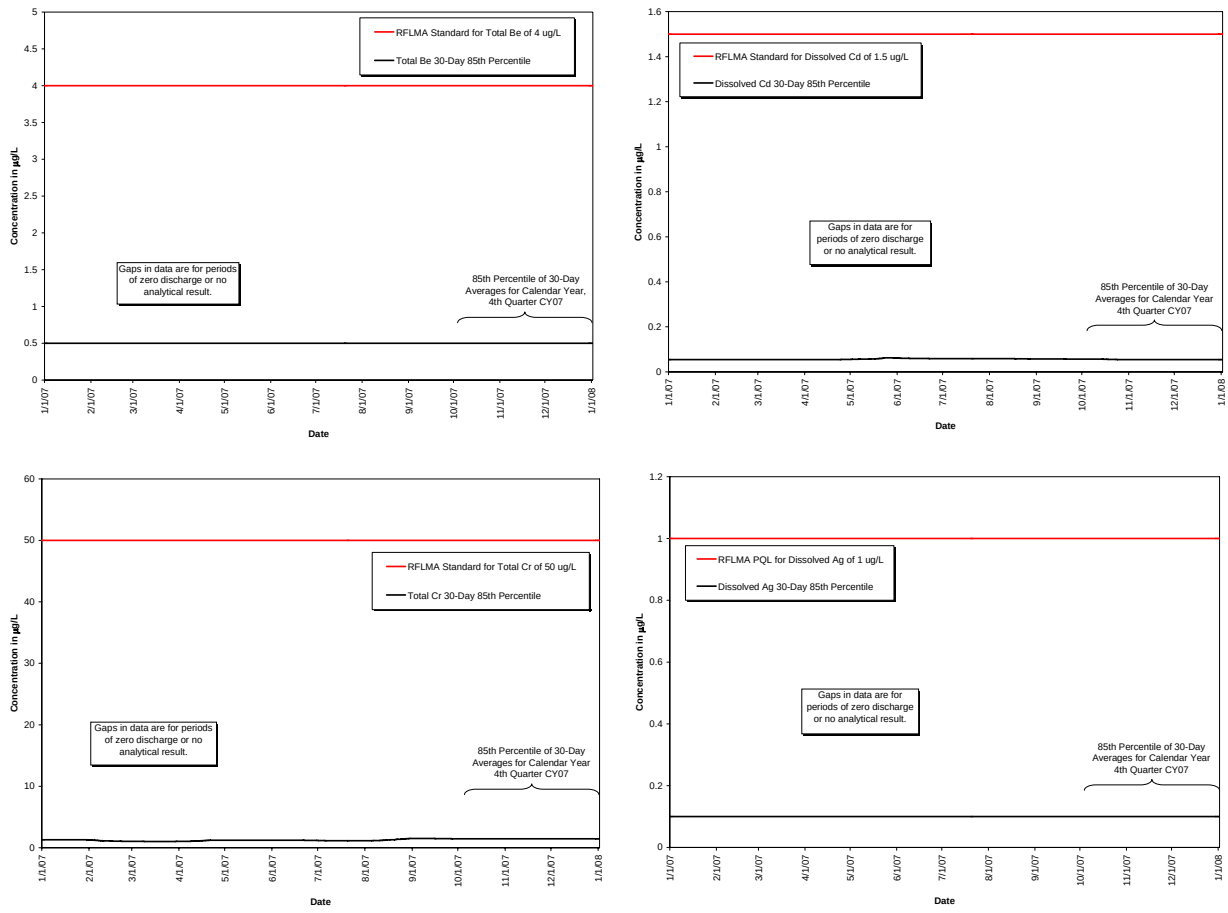


Figure 3-29. Volume-Weighted Average Metals Compliance Values at SW093: Calendar Year Ending Fourth Quarter CY 2007

3.1.2.3 AOC Wells and SW018

AOC wells (Figure 3-30 and Table 3-19) are located to evaluate potential groundwater impacts to surface water. Impacts are based on a minimum of two routinely scheduled sampling events in a row, not on a single data point. Analytical results from AOC wells are compared directly against the appropriate surface-water standards in Table 1 of Attachment 2 to RFLMA or the RFLMA U groundwater threshold value of 120 µg/L. Analytical data from surface-water performance location SW018, where grab samples for VOCs are collected to support groundwater objectives, are assessed in a manner similar to data from AOC wells.

Table 3-19. Sampling and Data Evaluation Protocols at AOC Wells and SW018

Location Code	Location Description	Sample Types/Frequencies	Analytes[a]	Data Evaluation
00193	Woman Creek upstream of Pond C-2	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U	See Figure 7 in Appendix D
00997	South Walnut Creek upstream of Pond B-5	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 7 in Appendix D
10304	Southeast of 903 Pad/Ryan's Pit Plume at Woman Creek	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 7 in Appendix D
10594	North Walnut Creek downstream of Pond A-1	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 7 in Appendix D
11104	Downgradient, downstream	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U	See Figure 7 in Appendix D
4087	Below Landfill Pond	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 7 in Appendix D
42505	Terminus of FC-2	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 7 in Appendix D
89104	Downgradient at Woman Creek	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 7 in Appendix D
B206989	Below Landfill Pond	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 7 in Appendix D
SW018	FC-2 west of former Building 771 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 7 in Appendix D

Notes: [a]Samples for the analysis of U are field-filtered using a 0.45-micron in-line filter.
Nitrate is analyzed as nitrate+nitrite as N; this result is conservatively compared to the nitrate standard only.

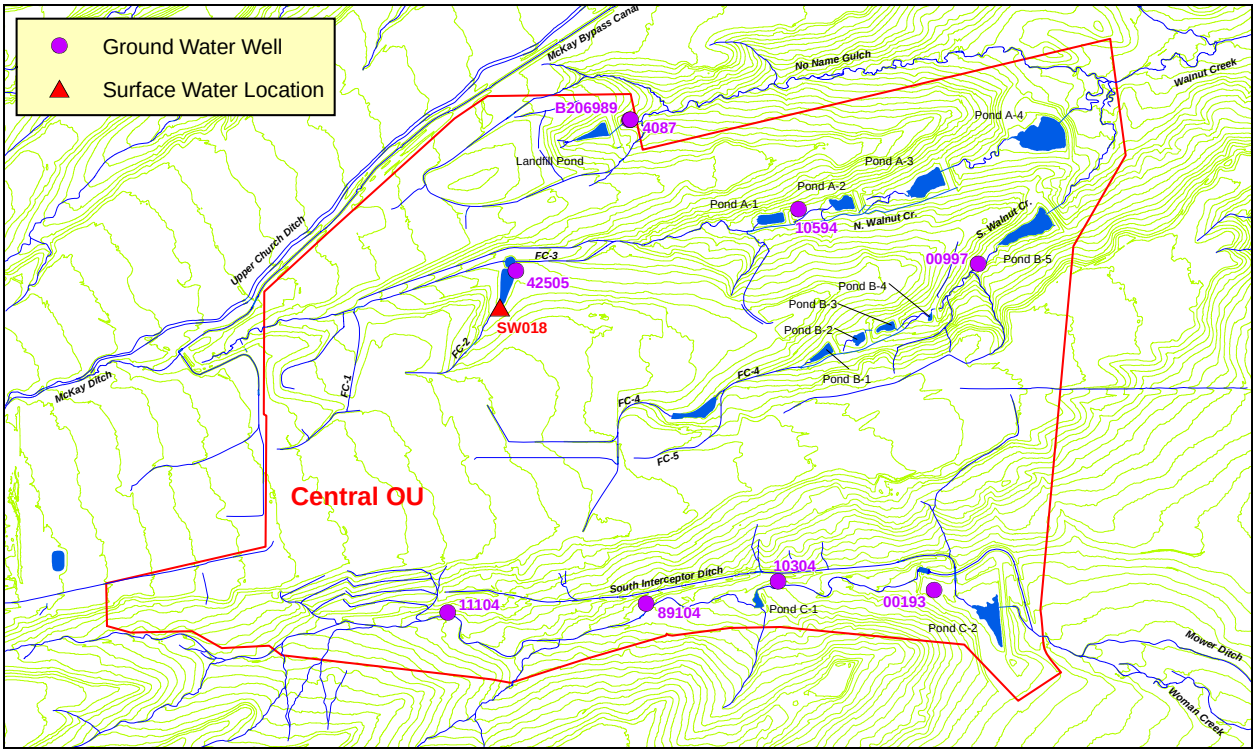


Figure 3-30. AOC Well and SW018 Locations

Data Evaluation

All AOC wells and SW018 were scheduled for routine monitoring in fourth quarter CY 2007. No decision criteria were triggered by the associated analytical results (Appendix B), which were consistent with previous data. However, AOC well 10594, located in North Walnut Creek near Pond A-1, reported a U concentration (130 µg/L) that exceeds the associated 120 µg/L threshold. This was the first such result received since RFLMA was signed; if two consecutive results above the threshold are reported, a reportable condition will exist. It bears noting that concentrations of U in this well have repeatedly been determined to be 100 percent natural (most recently for a sample in September 2007 that was sent for LANL analysis), and have exceeded the 120 µg/L threshold on numerous occasions in the past. In addition, trend calculations performed for U data from well 10594 indicate an apparent decreasing trend, but with a statistical significance of less than 80 percent (and, therefore, also less than the required 95 percent). Monitoring will continue as prescribed in RFLMA (DOE 2007d).

A reportable condition was encountered for AOC well B206989 in August 2007 (see corresponding RFLMA Contact Record 2007-06 in Appendix H) due to elevated concentrations of nitrate in groundwater samples from this well. Concentrations reported in fourth quarter CY 2007 are consistent with previous data. S-K trend calculations continue to suggest nitrate concentrations in samples from this well are decreasing, but at less than an 80-percent level of significance.

3.1.2.4 Boundary Wells

Boundary wells (Figure 3-31 and Table 3-20) are located at the Walnut Creek/Indiana Street and Woman Creek/Indiana Street intersections to provide surrounding stakeholders with assurance that groundwater leaving the historic extent of the Rocky Flats Environmental Technology Site (RFETS) in these drainages is not adversely impacted by the Site.

Monitoring the Boundary wells is not required by the CAD/ROD. However, these wells are included in the network to satisfy operational monitoring requirements in RFLMA.

Table 3-20. Sampling and Data Evaluation Protocols at Boundary Wells

Location Code	Location Description	Sample Types/Frequencies	Analytes[a]	Data Evaluation
10394	Woman Creek at Indiana Street	Annual grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 7 in Appendix D
41691	Walnut Creek at Indiana Street	Annual grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 7 in Appendix D

Notes: [a]Samples for the analysis of U are field-filtered using a 0.45-micron in-line filter.
Nitrate is analyzed as nitrate+nitrite as N; this result is conservatively compared to the nitrate standard only.

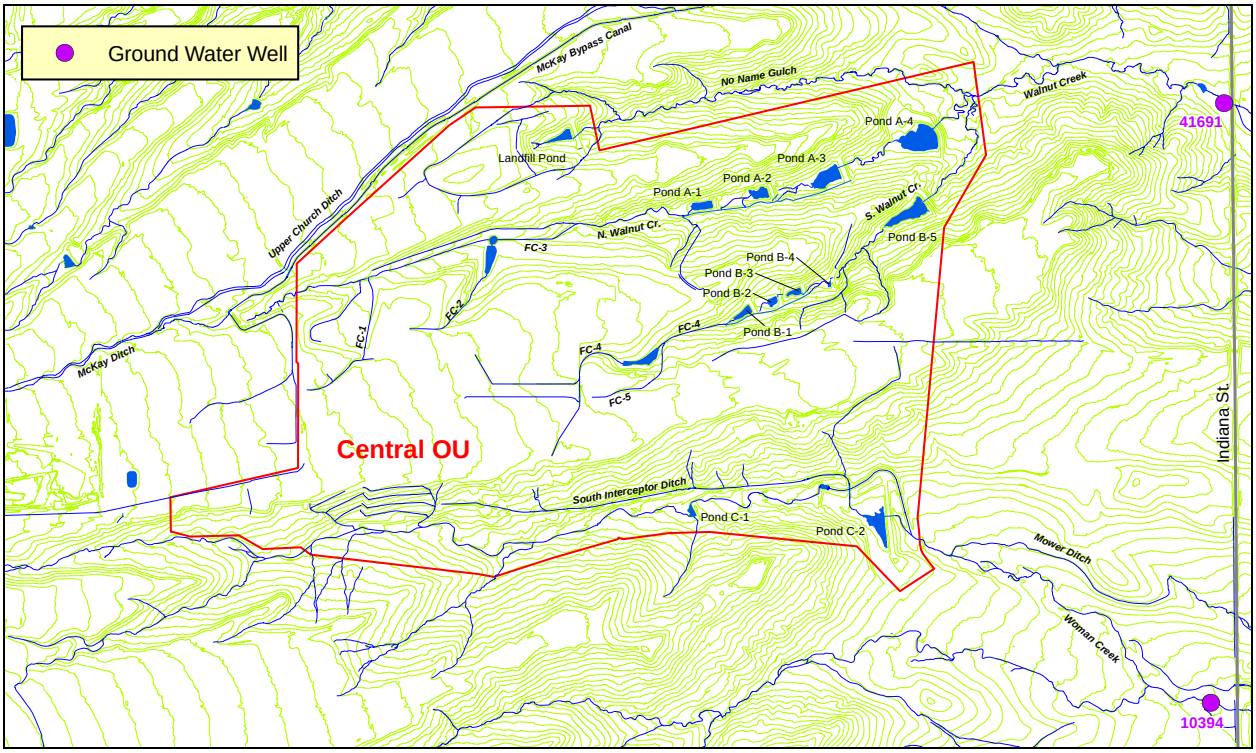


Figure 3-31. Boundary Well Locations

Data Evaluation

Both Boundary wells were sampled in second quarter CY 2007. All results were below RFLMA standards.

3.1.2.5 Sentinel Wells

Sentinel wells (Figure 3-32 and Table 3-21) are located near downgradient edges of contaminant plumes, in drainages, at groundwater treatment systems, and along contaminant pathways to surface water. These wells are monitored to determine whether concentrations of contaminants are increasing, thereby providing advance warning of potential groundwater quality impacts to the downgradient AOC well(s). Confirmation of a potential impact to downgradient wells will require an analytical record that consistently indicates an impact, not a single data point that indicates a contaminant has been detected.

Sentinel wells are used to monitor the performance of an accelerated action (including soil/source removals, in situ contaminant plume treatment, groundwater intercept components of treatment systems, and facility demolitions) and assess contaminant trends at important locations. Data from Sentinel wells are supplemented by those from Evaluation wells, and are used to determine when monitoring may cease or additional remedial work should be considered.

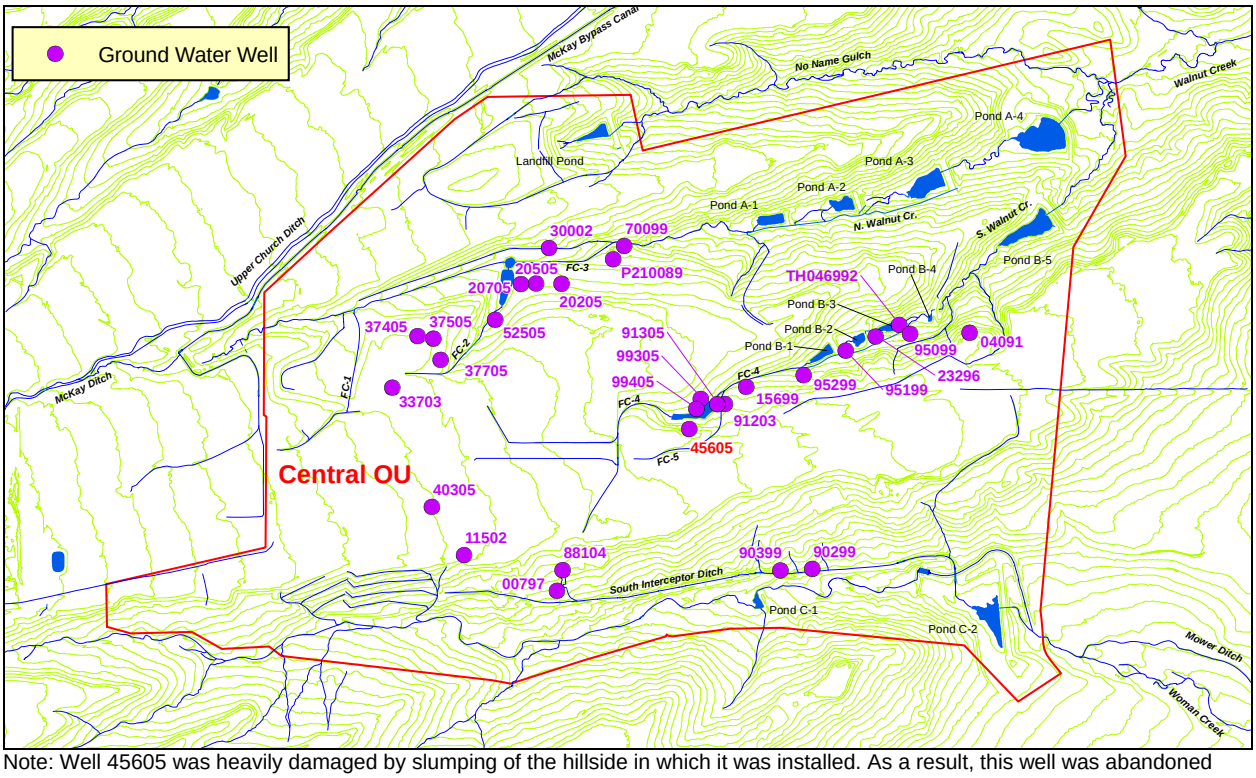
Table 3-21. Sampling and Data Evaluation Protocols at Sentinel Wells

Location Code	Location Description	Sample Types/Frequencies	Analytes[a]	Data Evaluation
00797	South of former Building 881 (B881) area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U	See Figure 8 in Appendix D
04091	East of source area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
11502	Southeast of former B444 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U	See Figure 8 in Appendix D
15699	Downgradient of MSPTS intercept trench	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
20205	North/northeast of former B771/774 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, Pu, Am	See Figure 8 in Appendix D
20505	North of former B771/774 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, Pu, Am	See Figure 8 in Appendix D
20705	North/northwest of former B771 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate, Pu, Am	See Figure 8 in Appendix D
23296	Downgradient of ETPTS intercept trench	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U	See Figure 8 in Appendix D
30002	Downgradient at North Walnut Creek	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
33703	Downgradient of source area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
37405	North/northeast part of former B371/374 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate, Pu, Am	See Figure 8 in Appendix D
37505	North part of former B371 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 8 in Appendix D

Table 3−21 (continued). Sampling and Data Evaluation Protocols at Sentinel Wells

Location Code	Location Description	Sample Types/Frequencies	Analytes[a]	Data Evaluation
37705	East/southeast of former B371/374 area at foundation drain confluence	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate, Pu, Am	See Figure 8 in Appendix D
40305	East part of former B444 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U	See Figure 8 in Appendix D
45605	Adjacent to remnants of SW056 French drain and drain interruption	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
52505	West of former IHSS 118.1 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
70099	Northwest (side-gradient) of SPPTS intercept trench	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	U, nitrate	See Figure 8 in Appendix D
88104	South part of former B881 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U	See Figure 8 in Appendix D
90299	Southeast part of 903 Pad/Ryan's Pit Plume at SID	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
90399	Southeast part of 903 Pad/Ryan's Pit Plume at SID	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
91203	Downgradient of Oil Burn Pit (OBP) #2 source area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
91305	South of confluence of FC-4 and FC-5	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 8 in Appendix D
95099	Downgradient of ETPTS intercept trench	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
95199	Downgradient of ETPTS intercept trench	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
95299	Downgradient of ETPTS intercept trench	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D
99305	East part of former B991 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 8 in Appendix D
99405	Southeast part of former B991 area	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 8 in Appendix D
P210089	Downgradient (north) portion of SPP	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs, U, nitrate	See Figure 8 in Appendix D
TH046992	Downgradient of ETPTS intercept trench	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 8 in Appendix D

Notes: [a]Samples for the analysis of U are field-filtered using a 0.45-micron in-line filter.
Nitrate is analyzed as nitrate+nitrite as N; this result is conservatively compared to the nitrate standard only.
IHSS = Individual Hazardous Substance Site



Note: Well 45605 was heavily damaged by slumping of the hillside in which it was installed. As a result, this well was abandoned following sample collection in fourth quarter CY 2007 and will be replaced in 2008.

Figure 3-32. Sentinel Well Locations

Data Evaluation

All Sentinel wells were monitored in fourth quarter CY 2007 (refer to Appendix B for analytical results).

Analytical data are generally consistent with previous results. Data for well 45605 represent the last samples that will be collected from this well. Movement of the slump (located south of former Building 991) in which the well was installed heavily damaged the well. After the fourth-quarter sample was collected, the well was abandoned and the slump was regraded. The well will be replaced in 2008.

The result for trichloroethene (TCE) from well 23296 (8.5 µg/L) is unusually low; however, the data were validated and TCE concentrations typically have been highly variable in samples from this well.

Vinyl chloride (VC) was detected at 0.46 µg/L (J-qualified, indicating this is an estimated concentration) in samples from well 52505, located between former Building 371/374 and Building 771. The presence of VC may be indicative of biodegradation of other, primary contaminants, such as tetrachloroethene (PCE) or TCE.

Trend plots are included in Appendix A. These data and statistical results are discussed in greater detail in Section 3.1.5.3.

3.1.2.6 Evaluation Wells

Evaluation wells (Figure 3-33 and Table 3-22) are located within groundwater contaminant plumes and near plume source areas, and within the interior of the COU at the Site. As such, they may monitor the effects of accelerated actions that have been performed (e.g., source removal and in situ treatment). Data from these Evaluation wells are therefore appropriate to determine whether monitoring of a particular plume and source area may cease, and provide data to support the determination of whether corresponding groundwater plume treatment systems may be decommissioned. In addition, Evaluation wells are used to support any groundwater evaluations that may be needed as a result of changing contaminant characteristics in downgradient Sentinel and/or AOC wells. Data from these wells also assist evaluations of predictions made through groundwater modeling efforts.

Table 3-22. Sampling and Data Evaluation Protocols at Evaluation Wells

Location Code	Location Description	Sample Types/Frequencies	Analytes[a]	Data Evaluation
00191	East of former 903 Pad area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
00203	Downgradient (south) portion of SPP	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U	See Figure 9 in Appendix D
00491	Southeast of former 903 Pad area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
00897	Mound Site source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
3687	East Trenches source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
03991	East of East Trenches source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
05691	East Trenches source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
07391	Ryan's Pit source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
18199	North of former IHSS 118.1 source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
20902	Northwest of former IHSS 118.1 source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
21505	West of former B776/777 area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
22205	Downgradient (north) portion of SPP	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U	See Figure 9 in Appendix D
22996	East/northeast part of former B886 area	Biennial grabs; Second calendar quarter (high-water conditions)	U, nitrate	See Figure 9 in Appendix D

Table 3−22 (continued). Sampling and Data Evaluation Protocols at Evaluation Wells

Location Code	Location Description	Sample Types/Frequencies	Analytes[a]	Data Evaluation
30900	PU&D Yard Plume source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 9 in Appendix D
33502	OBP #1 source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 9 in Appendix D
33604	OBP #1 source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 9 in Appendix D
33905	North of former 231 Tanks area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
40005	West part of former B444 area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
40205	South part of former B444 end	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U	See Figure 9 in Appendix D
50299	East of former 903 Pad area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
51605	Downgradient, adjacent to GS13	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U	See Figure 9 in Appendix D
55905	North part of former B559 area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
56305	West part of former B559 area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
70705	East part of former B707 area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
79102	SPP source area - north	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 9 in Appendix D
79202	SPP source area - north	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 9 in Appendix D
79302	SPP source area - northeast	Biennial grabs; Second calendar quarter (high-water conditions)	U, nitrate	See Figure 9 in Appendix D
79402	SPP source area - northeast	Biennial grabs; Second calendar quarter (high-water conditions)	U, nitrate	See Figure 9 in Appendix D
79502	SPP source area - east	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 9 in Appendix D
79605	SPP source area - east	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
88205	South part of former B881 area	Biennial grabs; Second calendar quarter (high-water conditions)	U, nitrate	See Figure 9 in Appendix D
891WEL	OU 1 Plume source area	Biennial grabs; Second calendar quarter (high-water conditions)	U, nitrate	See Figure 9 in Appendix D

Table 3−22 (continued). Sampling and Data Evaluation Protocols at Evaluation Wells

Location Code	Location Description	Sample Types/Frequencies	Analytes[a]	Data Evaluation
90402	Southeast of former 903 Pad area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U	See Figure 9 in Appendix D
90804	Southeast part of 903 Pad/Ryan's Pit Plume	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
91105	OBP #2 source area	Biennial grabs; Second calendar quarter (high-water conditions)	U, nitrate	See Figure 9 in Appendix D
B210489	Downgradient of SPPTS	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U	See Figure 9 in Appendix D
P210189	SEP-area VOC plume source area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 9 in Appendix D
P208989	SPP source area - north	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U, nitrate	See Figure 9 in Appendix D
P114689	Southwest of former B559 area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U	See Figure 9 in Appendix D
P115589	West part of former B551 Warehouse area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs, U	See Figure 9 in Appendix D
P419689	Southeast of former B444 area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D
P416889	Southeast of former B444 area	Biennial grabs; Second calendar quarter (high-water conditions)	VOCs	See Figure 9 in Appendix D

Notes: [a]Samples for the analysis of U are field-filtered using a 0.45-micron in-line filter.
Nitrate is analyzed as nitrate+nitrite as N; this result is conservatively compared to the nitrate standard only.
PU&D = Property Utilization and Disposal
SEP = Solar Evaporation Pond

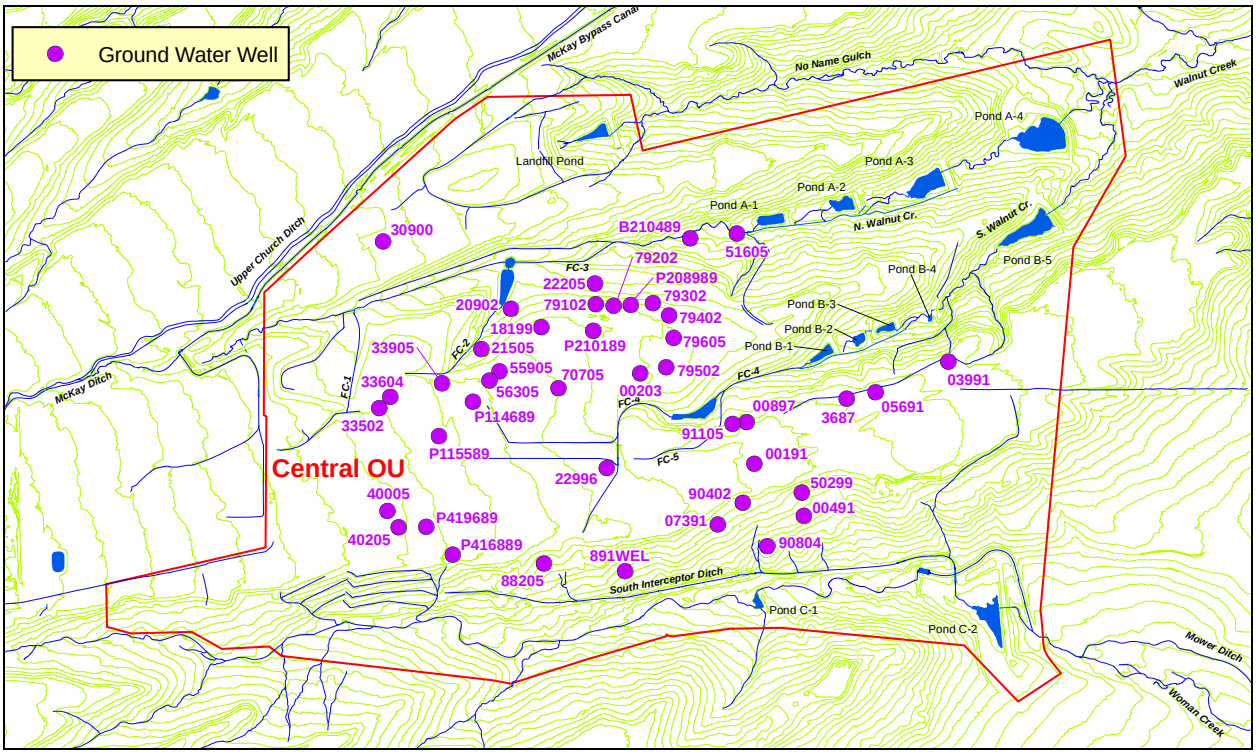


Figure 3-33. Evaluation Well Locations

Data Evaluation

Evaluation wells were not scheduled for routine monitoring in 2007; however, wells 00191, 07391, 18199, 33502, 33604, 51605, and 91105 were sample for nonroutine monitoring. Such monitoring supports investigation and performance data needs. See Section 3.1.5.2 for a discussion of the sample results for these Evaluation wells.

3.1.2.7 Investigative Monitoring

When reportable water-quality measurements are detected by surface-water monitoring at POEs or POCs, additional monitoring may be required to identify[12] the source and evaluate for mitigating action. Although not required by RFLMA, this investigative monitoring objective is intended to provide upstream water-quality information if reportable water-quality values are detected at POEs or POCs. Data collection is generally limited to POE and POC analytes and is intended to be discontinued once acceptable water quality has been demonstrated at POEs and POCs for an extended period.

Data collection is currently implemented at the locations listed in Table 3-23 and shown on Figure 3-34. The majority of these locations are sampled primarily to satisfy other monitoring objectives, although the data are used for this investigative objective. The current locations were not chosen in response to a specific source evaluation. They were chosen preemptively as a BMP immediately following cleanup and closure work and are intended to be discontinued under this

[12] Note that the term "identify" is used here to mean "locate." Characterization is also implied.

monitoring objective based on data evaluation. Any future data collection upstream of POEs and POCs, subject to the consultative process, is not limited to the locations in Table 3-23. The parties may also elect to collect data using other methods, subject to the characteristics of the reportable water-quality values and through the consultative process.

Table 3-23. Sampling and Data Evaluation Protocols at Investigative Monitoring Locations

Location Code	Location Description	Sample Types/Frequencies	Analytes	Data Evaluation
GS05	Woman Creek at western POU boundary	Continuous flow-paced composites; frequency varies (target is 8 per year)[a]	total U isotopes[b]	see Figure 6-15 in Appendix D
GS13	North Walnut Creek just upstream of A-Series Bypass	Continuous flow-paced composites; frequency varies (target is 8 per year)[a]	total U isotopes[b]	see Figure 6-15 in Appendix D
GS51	Drainage area tributary to the SID and south of former 903 Pad/Lip	Continuous flow-paced composites; frequency varies (target is 8 per year)[a]	total Pu and Am; [TSS[c]]	see Figure 6-15 in Appendix D
GS59	Woman Creek 800 feet east of OLF	Continuous flow-paced composites; frequency varies (target is 8 per year)[a]	total U isotopes[b]	see Figure 6-15 in Appendix D
SW018	FC-2 west of former Building 771 area	Continuous flow-paced composites; frequency varies (target is 8 per year)[a]	total Pu and Am; [TSS[c]]	see Figure 6-15 in Appendix D

Notes: [a]Frequency depends on available flow.
[b]U isotopes are U-233,234 + U-235 + U-238.
[c]Total suspended solids (TSS) is analyzed when the composite sampling period is within TSS hold-time limits.

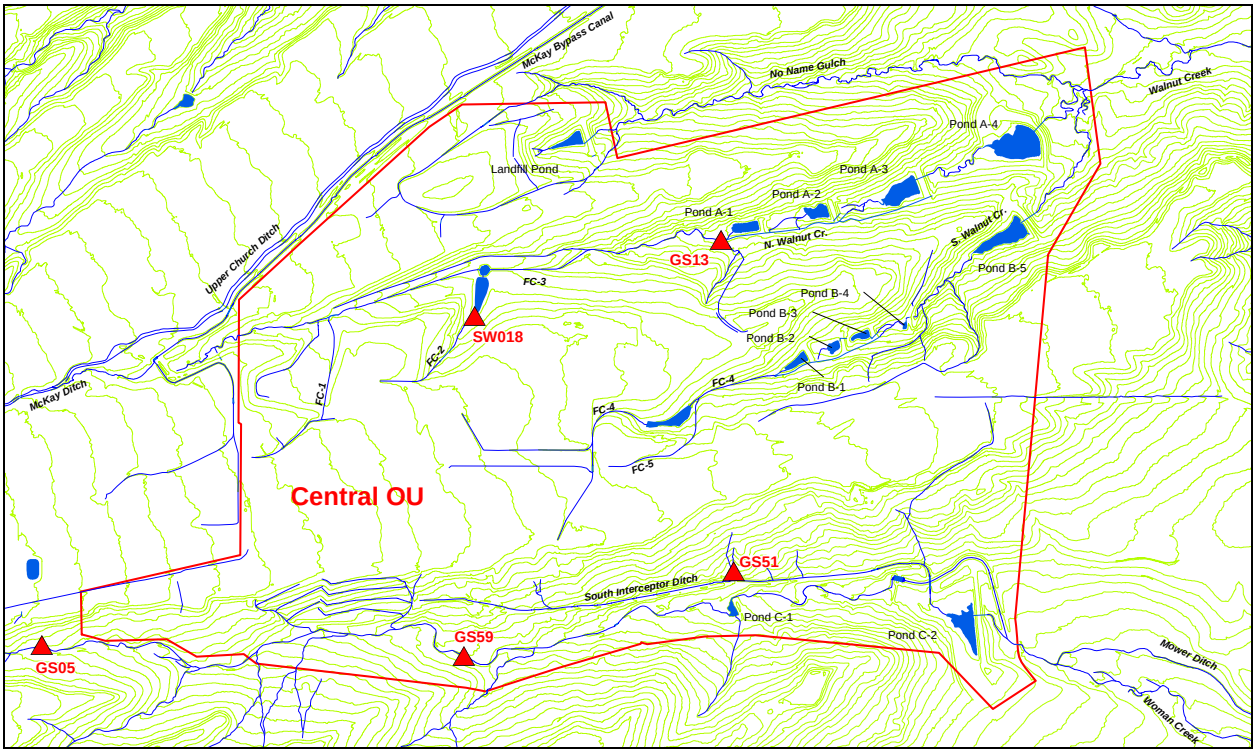


Figure 3-34. Investigative Monitoring Locations

Data Evaluation

During CY 2007, five investigative locations were operational (Table 3-23). As of November 26, 2007, analysis of composite samples collected at SW018 for Pu and Am has been discontinued. This action has been taken in accordance with the Investigative Monitoring flowchart (see Appendix D) for upstream locations where no reportable compliance values have been observed at a downstream POE or POC. Composite samples for Pu and Am will continue to be collected at SW018, but analysis will not be routinely conducted. These samples will be archived for 6 months, and will only be analyzed if required by a source evaluation triggered by reportable compliance values observed at a downstream POE or POC.

No routine data evaluation for the investigative objective is presented in this report. Refer to Appendix B, which contains the water-quality data, for additional information.

3.1.2.8 PLF Monitoring

The PLF is located in the COU just north of the former Industrial Area (IA). This objective deals with monitoring surface water and groundwater at the PLF to determine the short- and long-term effectiveness of the remedy. These requirements were initially identified in the *Final Interim Measures/Interim Remedial Action for IHSS 114 and RCRA Closure of the RFETS Present Landfill*, Appendix B: Post-Accelerated Action Monitoring and Long-Term Surveillance and Monitoring Considerations (DOE 2004), and finalized in the PLF M&M Plan (DOE 2006b).

Water monitoring locations for the PLF are shown on Figure 3-35. The surface-water and treatment system monitoring requirements deal specifically with the PLFTS and are discussed in detail in Section 3.1.2.10. Details regarding general groundwater monitoring are provided below.

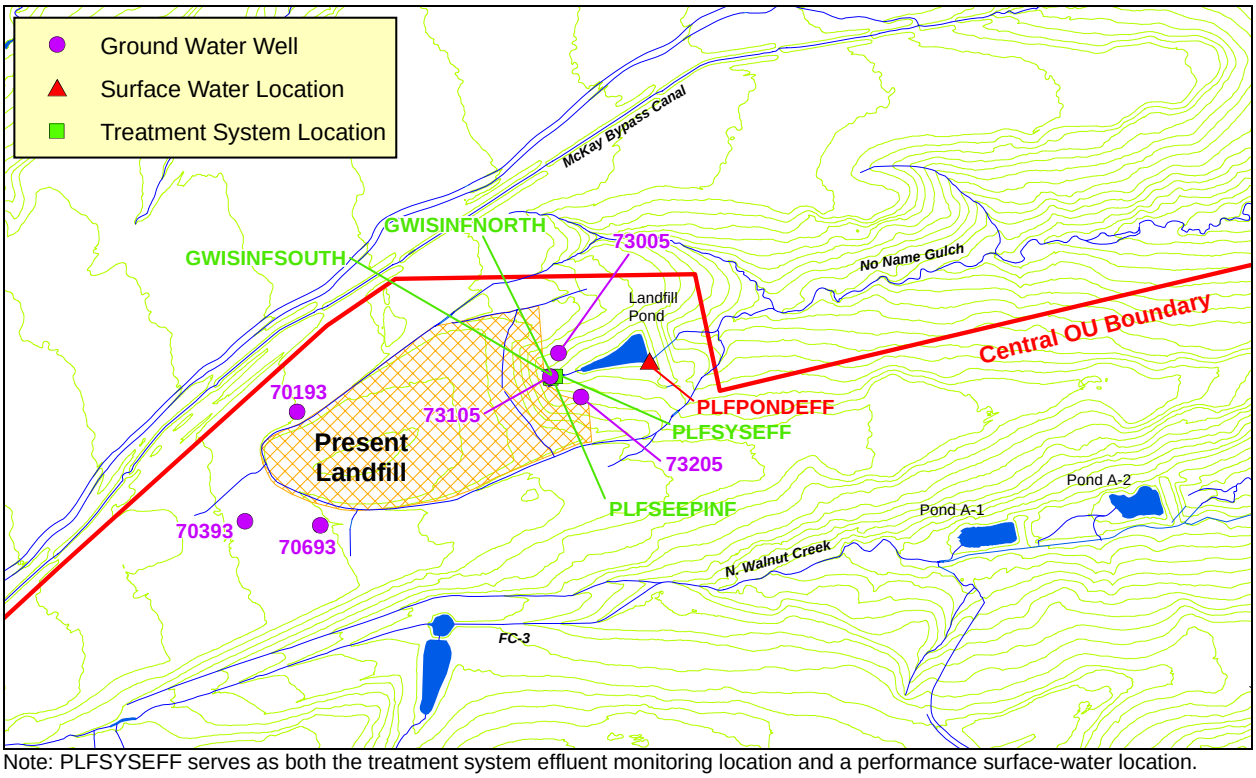
The RCRA monitoring network at the PLF comprises six wells: three are located upgradient of the landfill, and three are downgradient of the landfill but upgradient of the Landfill Pond. The RCRA wells are monitored in accordance with RFLMA. Decision rules are also set forth in that document; see Appendix D for the RFLMA decision flowcharts. Additional monitoring wells are present in the general vicinity of the PLF; however, they do not contribute to the RCRA monitoring of the landfill and are discussed in other sections of this report.

Sampling and data evaluation protocols for the RCRA wells at the PLF are provided in Table 3-24.

Table 3-24. Sampling and Data Evaluation Protocols at PLF RCRA Monitoring Wells

Location Code	Location Description	Sample Types/ Frequencies	Analytes[a]	Data Evaluation
70193	Upgradient (northwest) of the upgradient end of the PLF	Quarterly each calendar quarter	VOCs, metals	See Figure 10 in Appendix D
70393	Upgradient (west/southwest) of the upgradient end of the PLF	Quarterly each calendar quarter	VOCs, metals	See Figure 10 in Appendix D
70693	Upgradient (southwest) of the upgradient end of the PLF	Quarterly each calendar quarter	VOCs, metals	See Figure 10 in Appendix D
73005	Downgradient (northeast) of the downgradient end of the PLF	Quarterly each calendar quarter	VOCs, metals	See Figure 10 in Appendix D
73105	Downgradient (east) of the downgradient end of the PLF at the PLFTS	Quarterly each calendar quarter	VOCs, metals	See Figure 10 in Appendix D
73205	Downgradient (southeast) of the downgradient end of the PLF	Quarterly each calendar quarter	VOCs, metals	See Figure 10 in Appendix D

Notes: [a]Samples for the analysis of metals are field-filtered using a 0.45-micron in-line filter.
Laboratory analytes are limited to those based on the analytical methods listed in the PLF M&M Plan.



Note: PLFSYSEFF serves as both the treatment system effluent monitoring location and a performance surface-water location.

Figure 3-35. PLF Monitoring Locations

Data Evaluation

All RCRA wells at the PLF were sampled in fourth quarter CY 2007. Results are included in Appendix B. This section presents the evaluation of the PLF groundwater-quality data for all of CY 2007. Monitoring performed in 2007 is summarized in Table 3-25.

Table 3-25. RCRA Groundwater Sampling Performed in 2007 at the PLF

Well	Location	Q1	Q2	Q3	Q4
70193	Upgradient	V, M	V, M	V, M	V, M
70393	Upgradient	V, M	V, M	V, M	V, M
70693	Upgradient	V, M	V, M	V, M	V, M
73005	Downgradient	V, M	V, M	V, M	V, M
73105	Downgradient	V, M	V, M	V, M	V, M
73205	Downgradient	V, M	V, M	V, M	V, M

Notes: Q = quarter. V = VOCs, M = metals (which includes U). Only RFLMA-defined (DOE 2007d) RCRA wells supporting the PLF are listed; other wells in the area (such as Sentinel and Evaluation wells) are omitted because they are not part of the RCRA monitoring network.

Downgradient water quality (as represented by analytical data from wells 73005, 73105, and 73205) was statistically compared against upgradient water quality (as represented by analytical data from wells 70193, 70393, and 70693). Generally speaking, water quality in the upgradient wells continues to be more impacted than that in the downgradient wells, because upgradient wells 70393 and 70693 are within the margins of the Property Utilization and Disposal (PU&D) Yard Plume.

Statistical evaluation of the analytical data from the PLF was performed using all nonrejected data for upgradient and downgradient RCRA wells. An interwell comparison was made (i.e., comparing upgradient wells against downgradient wells) in accordance with RFLMA and the PLF M&M Plan, using the Analysis of Variance (ANOVA) procedure as run using the Sanitas™ software package (Sanitas Technologies 2007). Results for U were all converted to mass units: first, any negative values for isotopic analyses were replaced with 0.001, then the individual results were converted to mass units and summed to provide a conservative approximation of total U by mass. Replacement with 0.001 was also performed for any total U results that were equal to or less than zero to abide by software limitations, as discussed in Section 3.1.1.2. The data were also assessed for trends, again using Sanitas™ and the S-K trending method in keeping with the findings of previous studies indicating this method to be most appropriate for Rocky Flats groundwater data (KH 2004d).

A year of quarterly analytical data (i.e., four sets of quarterly samples) are required to determine the baseline, and the same quantity of data are needed to perform the ANOVA statistical analyses. To calculate S-K trends based on four seasons—as represented by the four quarters of sampling—requires four sets of results for each of the four quarters. Therefore, while there is sufficient data for the ANOVA assessment, there is not yet sufficient data for trend calculations.

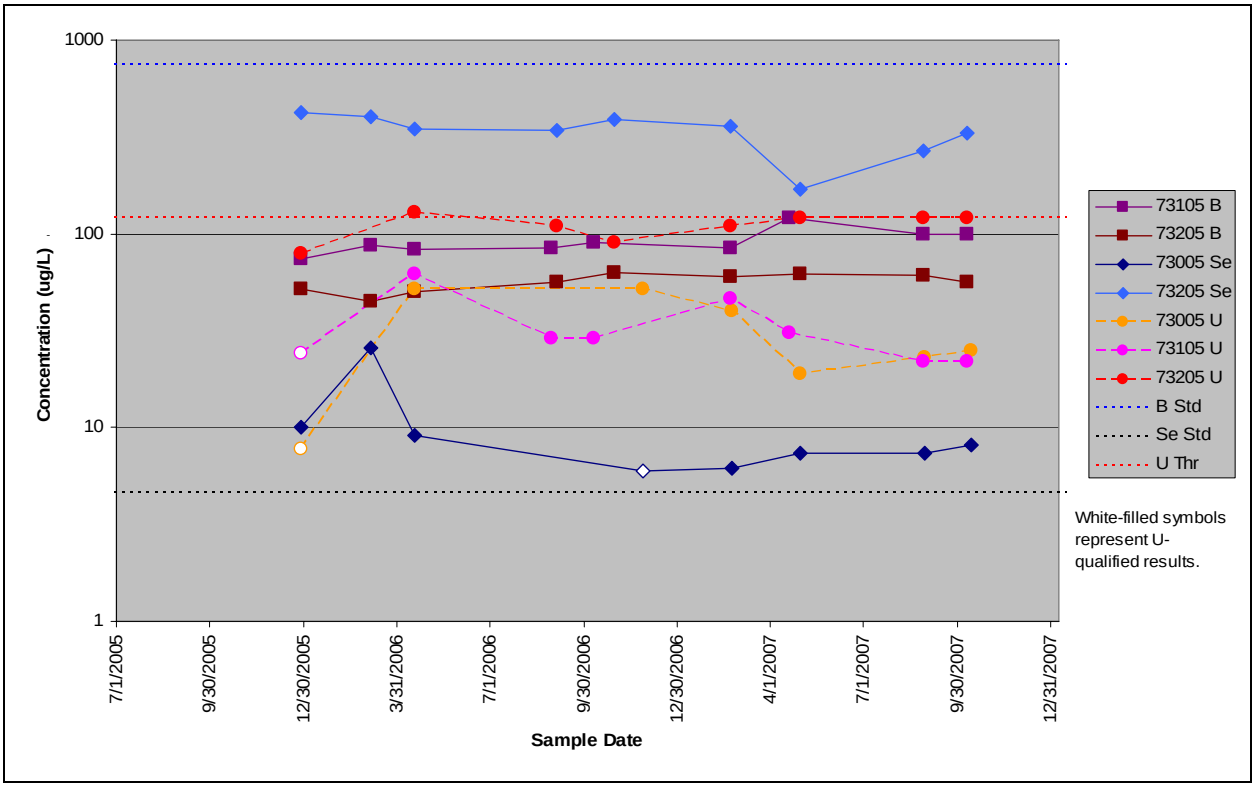
ANOVA evaluation of the groundwater analytical data from PLF RCRA wells indicates groundwater sample results from some of the downgradient wells are statistically higher in the concentration of certain constituents. No VOCs were found to be present in downgradient wells at statistically higher concentrations than in upgradient wells; however, the concentrations of several metals are statistically higher in downgradient wells. Downgradient wells 73105 and 73205 produce groundwater samples with statistically higher concentrations of boron (B) than upgradient wells. The same applies to downgradient wells 73005 and 73205 for selenium (Se), and all three downgradient wells are higher in U concentrations. Table 3-26 summarizes the ANOVA results.

Table 3-26. Results of Groundwater ANOVA Evaluation at the PLF

Analyte	73005	73105	73205
Boron		x	x
Selenium	x		x
Uranium	x	x	x

Note: x = analyte is present in groundwater at a statistically significant higher concentration in the indicated downgradient well compared to upgradient wells.

Concentrations of B in downgradient groundwater are uniformly well under the RFLMA Table 1 standard of 750 µg/L. Concentrations of Se in groundwater samples from downgradient well 73005 frequently exceed the 4.6 µg/L RFLMA standard. The highest reported concentration was 26 µg/L (March 2006). However, many results are B-qualified (indicating the result was identified below the required detection limit but above the instrument detection limit) and one result in fourth quarter CY 2006 is reported as a nondetect. Conversely, the Se standard is consistently exceeded by samples from well 73205. Concentrations in this well have ranged from 170 µg/L to 420 µg/L, with an average concentration (based on nine samples) of approximately 337 µg/L. Time-series plots of Se concentrations in groundwater samples from wells 73005 and 73205 are displayed on Figure 3-36.



Notes: Only those analyte-well combinations identified in the ANOVA evaluation of PLF groundwater data are shown. RFLMA action levels are published in DOE 2007d. B = boron, Se = selenium, U = uranium. Several of the results for well 73005 are qualified with a B, but are not shown differently for simplicity. In addition to the nondetects (U-qualified results), several other results were qualified (B, J), but are not shown differently for the sake of simplicity. Note logarithmic concentration scale.

Figure 3-36. Boron, Selenium, and U in Downgradient Groundwater from PLF RCRA Wells Identified in ANOVA Data Evaluations

Although all three downgradient wells produce samples with concentrations of U that are statistically higher than in upgradient wells, only well 73205 produces samples with concentrations that are close to the U threshold of 120 μg/L. To date, U data from this well include one result (collected in 2006) exceeding that concentration, and the last three samples collected in 2007 (representing the second, third, and fourth calendar quarters of 2007) returned U results that are equal to the threshold. The other downgradient wells produce groundwater samples with U concentrations that are less than the threshold.

It is also worth noting that the ANOVA assessment identified many fewer analytes with higher downgradient than upgradient concentrations than was the case for the 2006 report (DOE 2007e). Each of the constituents identified in the 2007 ANOVA assessment as being present in higher concentrations downgradient than upgradient—B, Se, and U—was also identified in 2006, but many other metals were also identified in the earlier year. This change is likely due to the larger data set, which smoothes out anomalies. In addition, B was identified in the 2006 report as being statistically higher in all three downgradient wells, but the assessment for 2007 did not find this to be the case for well 73005. There was no change from 2006 to 2007 with respect to Se. Data limitations in 2006 at well 73005 prevented the determination of whether U was statistically higher in this well than in upgradient wells, but both the other downgradient wells were identified as producing samples with significantly higher U concentrations than upgradient wells.

Per RFLMA, if downgradient concentrations are significantly greater than upgradient concentrations and downgradient concentrations show a statistically significant increasing trend, the consultative process is initiated to determine the appropriate response. As noted above, there are insufficient data for proper trend calculations, although the results of trending efforts are included in Appendix B.3. RCRA monitoring will continue in accordance with RFLMA, and future data will be assessed for statistical trend in these downgradient wells.

Groundwater quality at the PLF is impacted on the upgradient side by VOCs from the PU&D Yard Plume. However, data from the RCRA wells in 2007 showed no VOCs were detected in downgradient groundwater. Conversely, as reported in 2006 several VOCs were detected (DOE 2007e).

Groundwater flow at the PLF is strongly affected by the GWIS, which diverts groundwater flow around the perimeter of the PLF rather than through the wastes. The GWIS includes a slurry wall and perforated drain around the upgradient and side-gradient perimeter of the PLF, and acts to isolate groundwater within the PLF from that outside the PLF. (Refer to the previously published reports referenced earlier in this section for more detail on the GWIS and related discussions.) Previous RCRA and Groundwater Annual Reports have confirmed the effectiveness of this isolation. Because the GWIS is located between the upgradient PLF RCRA wells and the downgradient PLF RCRA wells, estimating seepage velocities as discussed in Section 3.1.3.5 between those sets of wells is not appropriate.

3.1.2.9 OLF Monitoring

The OLF is located in the COU just south for the former IA. This objective addresses monitoring surface water and groundwater at the OLF to determine the short- and long-term effectiveness of the remedy. These requirements were initially identified in the *Draft Final IM/IRA of IHSS Group SW-2, IHSS 115, Original Landfill and IHSS 196, Filter Backwash Pond,* Appendix B:

Post-Accelerated Action Monitoring and Long-Term Surveillance and Monitoring Considerations (DOE 2005a), and finalized in the OLF M&M Plan (DOE 2006a).

Four groundwater monitoring wells were identified to monitor the OLF, and are classified as RCRA wells in RFLMA; three of these wells were installed in 2005. One of the OLF RCRA wells is located upgradient of the landfill, and three are downgradient of the landfill but upgradient of Woman Creek. The RCRA wells are monitored in accordance with RFLMA. Decision rules are also set forth in that document; see Appendix D for the RFLMA decision flowcharts. Additional monitoring wells are present in the general vicinity of the OLF; however, they do not contribute to the RCRA monitoring of the facility and therefore are discussed in other sections of this report.

Surface-water and RCRA groundwater monitoring locations for the OLF are shown on Figure 3-37. Sampling and data evaluation protocols are summarized in Table 3-27 and Table 3-28.

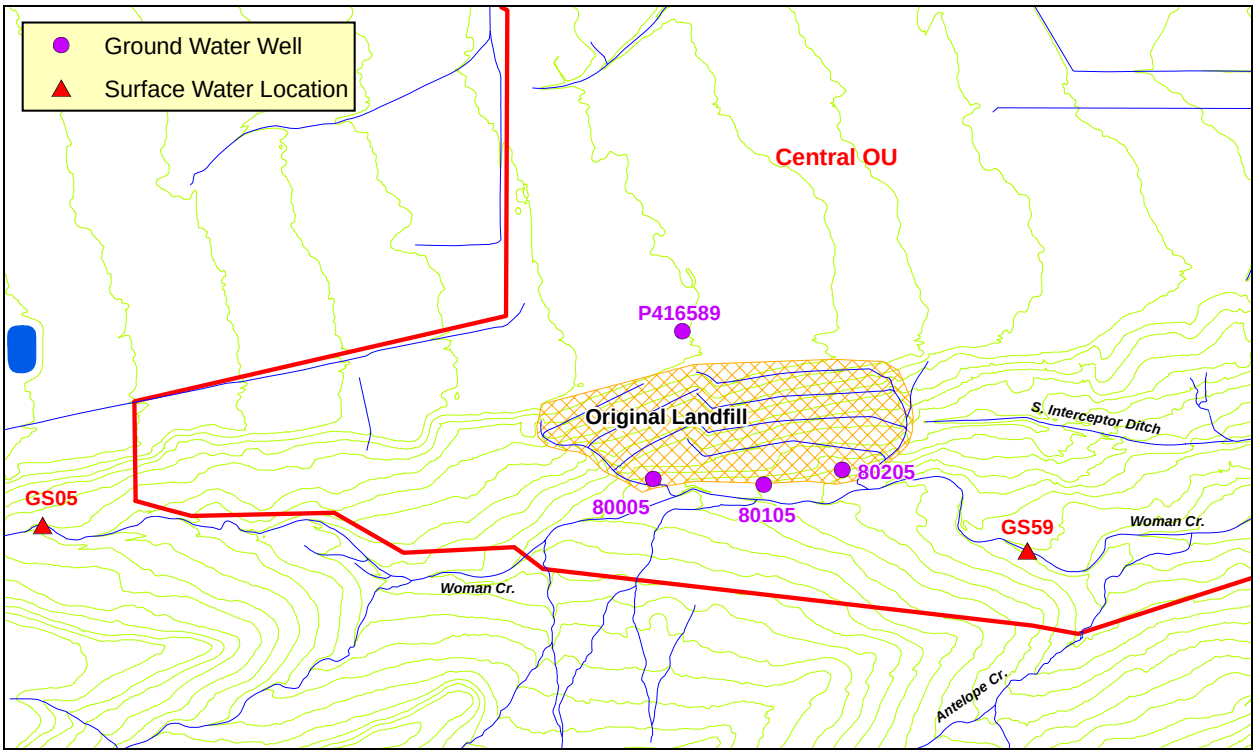


Figure 3-37. OLF Monitoring Locations

Table 3-27. Sampling and Data Evaluation Protocols at OLF Surface-Water Monitoring Locations

Location Code	Location Description	Sample Types/ Frequencies	Analytes[b]	Data Evaluation
GS05; upgradient	Woman Creek at west POU fenceline	Quarterly grab samples[a]	total U isotopes[c]; dissolved and total metals; VOCs; Hg	see Figure 12 in Appendix D
GS59; downgradient	Woman Creek 800 feet downstream of OLF	Quarterly grab samples[a]	total U isotopes[c]; dissolved and total metals; VOCs; Hg	see Figure 12 in Appendix D

Notes: [a]Samples for isotopic U and metals are currently collected as continuous flow-paced composites in conjunction with the Investigative monitoring objective; decisions specifically for the OLF monitoring objective only require quarterly grabs.
[b]Laboratory analytes are limited to those based on the analytical methods listed in the OLF M&M Plan.
[c]U isotopes are U-233,234 + U-235 + U-238.

Table 3-28. Sampling and Data Evaluation Protocols at OLF RCRA Monitoring Wells

Location Code	Location Description	Sample Types/ Frequencies	Analytes[a]	Data Evaluation
P416589	Upgradient (north) of the OLF	Quarterly each calendar quarter	VOCs, SVOCs, metals	See Figure 10 in Appendix D
80005	Downgradient (south) of the western portion of the OLF	Quarterly each calendar quarter	VOCs, SVOCs, metals	See Figure 10 in Appendix D
80105	Downgradient (south) of the central portion of the OLF	Quarterly each calendar quarter	VOCs, SVOCs, metals	See Figure 10 in Appendix D
80205	Downgradient (south) of the eastern portion of the OLF	Quarterly each calendar quarter	VOCs, SVOCs, metals	See Figure 10 in Appendix D

Notes: [a]Samples for the analysis of metals are field-filtered using a 0.45-micron in-line filter.
Laboratory analytes are limited to those based on the analytical methods listed in the OLF M&M Plan.

Data Evaluation

Analytical results for GS59 and GS05 are compared, per Figure 12 in Appendix D, to the appropriate surface-water standard in Table 1 of Attachment 2 to RFLMA. During CY 2007, selenium was detected above the standard in the October 1, 2007−January 4, 2008, composite sample. Selenium was observed at 6.7 µg/L at GS59, and the Table 1 standard is 4.6 µg/L. Per the RFLMA data evaluation flowchart (Appendix D), sampling frequency for selenium at the OLF surface-water locations has been increased to monthly pending future analytical results. All other analytical results were acceptable during CY 2007.

All RCRA wells at the OLF were sampled in fourth quarter CY 2007. Results are included in Appendix B. This section presents the evaluation of the CY 2007 groundwater-quality data for the OLF, previously known as OU 5. All RCRA wells are monitored quarterly. Monitoring performed in 2007 is summarized in Table 3-29.

Table 3-29. RCRA Groundwater Sampling Performed in 2007 at the OLF

Well	Location	Q1	Q2	Q3	Q4
P416589	Upgradient	V, M, S	V, M, S	V, M, S	V, M, S
80005	Downgradient	V, M, S	V, M, S	V, M, S	V, M, S
80105	Downgradient	V, M, S	V, M, S	V, M, S	V, M, S
80205	Downgradient	V, M, S	V, M, S	V, M, S	V, M, S

Notes: Q = quarter. V = VOCs, M = metals (which includes U), S = semivolatile organic compounds. Only RCRA wells supporting the OLF are listed; other wells in the area (such as AOC, Sentinel, and Evaluation wells) are omitted because they are not part of the RCRA monitoring network.

In addition to monitoring and evaluating these wells similar to RCRA wells (i.e., on a quarterly basis, and evaluating the resulting analytical data via upgradient-downgradient comparisons), the three downgradient wells are also monitored and evaluated in the manner of Sentinel wells. Specifically, data from these wells are statistically evaluated using 85th percentile concentrations to compare against surface-water standards, and data trends are constructed as warranted to determine a need for action. This type of evaluation requires a minimum of eight data points for each well-analyte combination to generate the 85th percentile concentrations, and four data points for each well-analyte-quarter combination to calculate trends.

As with the PLF, statistical evaluation of the analytical data from the OLF was performed using all nonrejected data for upgradient and downgradient RCRA wells. An interwell comparison was made (i.e., comparing the upgradient well against downgradient wells) in accordance with RFLMA and the OLF M&M Plan (DOE 2006a), using the ANOVA procedure as performed with the Sanitas™ software package (Sanitas Technologies 2007). Results for U were all reported in mass units, so no conversions were necessary. An attempt was also made to assess the data for trends, again using Sanitas™ and the S-K trending method in keeping with the findings of previous studies indicating this method to be most appropriate for Rocky Flats groundwater data (KH 2004d).

A year of quarterly analytical data (i.e., four sets of quarterly samples) are required to determine the baseline, and the same quantity of data are needed to perform the ANOVA statistical analyses. To date, the OLF is represented by more than 2 years (eight quarters) of data. To calculate S-K trends based on four seasons—as represented by the four quarters of sampling—requires four sets of results for each of the four quarters. Therefore, while there is sufficient data for the ANOVA assessment, there is not yet sufficient data for trend calculations.

ANOVA evaluation of the groundwater analytical data from OLF RCRA wells indicates groundwater samples from some of the downgradient wells are statistically higher in the concentration of certain constituents. No VOCs were found to be present in downgradient wells at statistically higher concentrations than in upgradient wells, but the concentrations of two metals are statistically higher in one or more downgradient wells. These results are summarized in Table 3-30.

Table 3-30. Results of Groundwater ANOVA Evaluation at the OLF

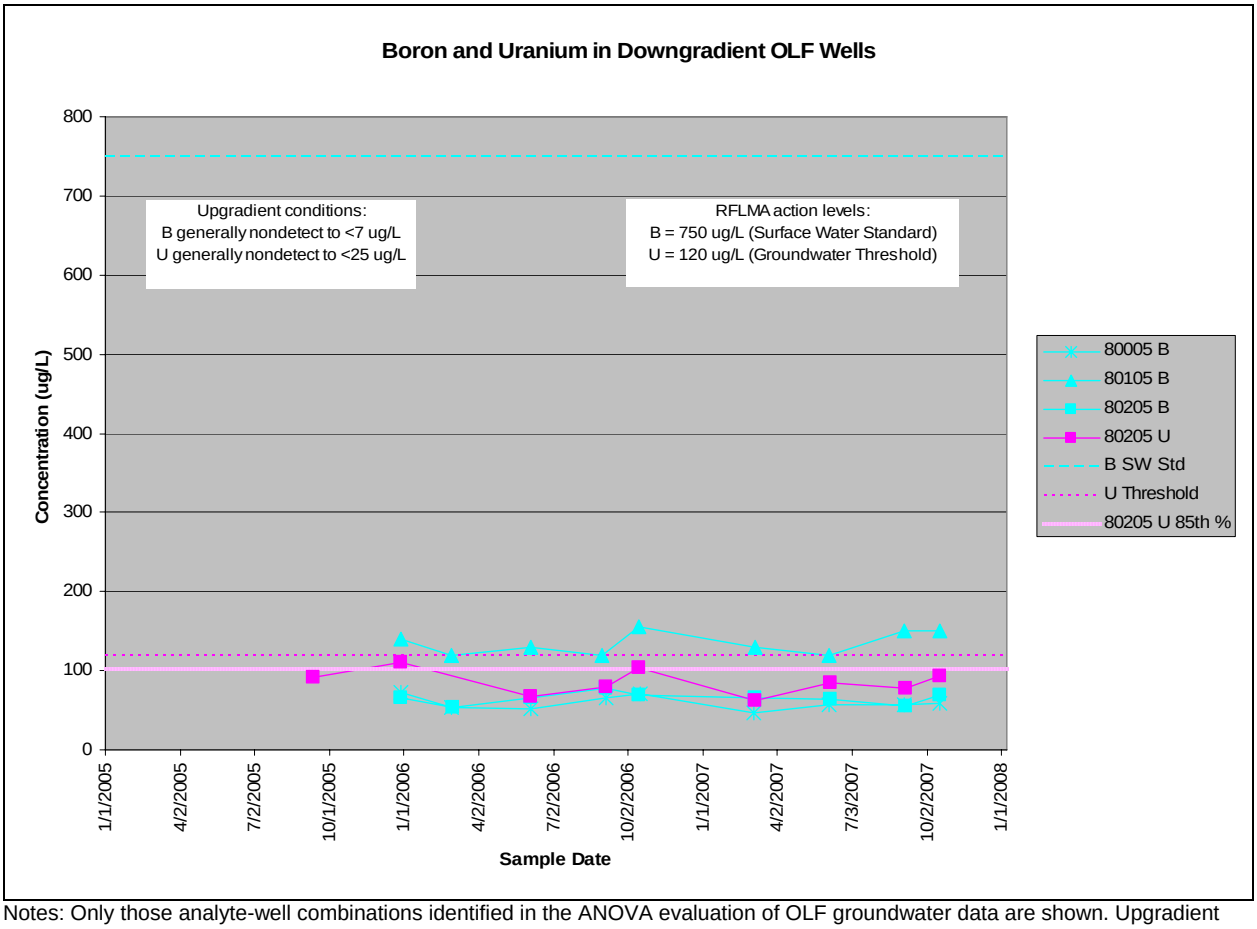
Analyte	80005	80105	80205
Boron	x	x	x
Uranium			x

Note: x = analyte is present in groundwater at a statistically significant higher concentration in the indicated downgradient well compared to upgradient wells, based on ANOVA statistical analyses performed using the Sanitas™ software package.

All three downgradient wells produce groundwater samples with statistically higher concentrations of B than the upgradient well. The same applies to downgradient well 80205 for U concentrations. Both of these conditions are unchanged from those reported in the 2006 Annual Report (DOE 2007e). However, for the 2006 report, the ANOVA analysis also indicated downgradient groundwater contained statistically higher concentrations of several additional metals: lithium in all three wells, manganese in well 80105, and strontium in wells 80105 and 80205. Differences in concentrations for these constituents no longer appear to be statistically significant.

Figure 3-38 provides time-series plots of B and U concentrations in groundwater from the wells listed in Table 3-30. As shown, concentrations of B in downgradient groundwater are uniformly well under the RFLMA Table 1 standard of 750 µg/L; the highest result reported to date is 155 µg/L from well 80105. The surface-water quality reported at downstream OLF location GS59 does not indicate B concentrations in downgradient OLF groundwater represent a threat.

Concentrations of U in samples from well 80205 are also shown on Figure 3-38, as is the U threshold of 120 µg/L. U concentrations at this well have yet to exceed the U threshold, and it follows that the 85th percentile concentration of U in samples from well 80205 also does not exceed this threshold (as described in the Sentinel well decision rules that also apply to downgradient OLF RCRA wells). And finally, the surface water monitored at location GS59 has not indicated U concentrations in downgradient OLF groundwater represent a threat to surface-water quality.



Notes: Only those analyte-well combinations identified in the ANOVA evaluation of OLF groundwater data are shown. Upgradient groundwater quality is represented by samples from OLF RCRA well P416589. RFLMA action levels are published in DOE 2007d. B = boron, U = uranium. The 85th percentile concentration of U in well 80205 is approximately 102 µg/L.

Figure 3-38. Boron and U in Groundwater Samples from Downgradient OLF Wells Identified in ANOVA Data Evaluations

In keeping with the recommendation made in the 2006 Annual Report (DOE 2007e) and CERCLA 5-year review (Section 2.2), groundwater from well 80205 was collected and analyzed using a high-resolution method (TIMS) to determine the isotopic signature of the water and its anthropogenic content. This sample was collected on September 7, 2007, and shipped to LANL for analysis and interpretation (see Appendix E for the analytical report). The total U concentration in that sample was reported at 79.2 nanograms per gram—equivalent to 79.2 µg/L—and was characterized as 100.0 percent natural. This indicates the OLF is not contributing anthropogenic U to groundwater monitored by well 80205.

Data reported in 2007 from downgradient RCRA wells at the OLF show two VOCs were detected in downgradient groundwater, although not at statistically higher concentrations than in the upgradient well. Validated detections are summarized in Table 3-31.

Table 3-31. VOCs Detected in 2007 in Downgradient Wells at the Original Landfill

Well	Sample Date	Analyte	Result	Units	Lab Qualifier
80005	3/5/07	TCE	0.16	µg/L	J
80005	6/4/07	1,3-Dichlorobenzene	0.2	µg/L	J
80105	6/5/07	1,3-Dichlorobenzene	0.22	µg/L	J

Note: J = analyte detected, result is estimated. No validation qualifiers were attached to these results.

Groundwater flow at the OLF is not affected by controls such as the GWIS at the PLF. Groundwater flows beneath the pediment surface north of the OLF in a general west to east direction. As it nears the southern edge of the pediment, groundwater is diverted to a more south-southeasterly direction. This latter general flow direction applies to groundwater moving through the OLF.

Groundwater flow velocities were calculated (see Section 3.1.3.5) for OLF well pair P416589 (the upgradient well) and 80105 (the middle downgradient well). The resulting estimates for the travel time from the upgradient to downgradient well range from just over 4 years to just over 4.5 years. Note that this calculated velocity is simplistic, and applies only to pure water; contaminants would be retarded to varying degrees.

Seeps are also present at the OLF, and have been observed in this area for decades (as well as being suggested on aerial photographs taken before the RFP came into existence). A new seep identified as Seep #8, located adjacent to well 80205, was sampled on August 23, 2007. No water-quality concerns were indicated; refer to the third quarter CY 2007 report (DOE 2008a) for the analytical data. Additional discussion of seeps at the OLF is provided in Section 2.5.2.2.

3.1.2.10 Groundwater Treatment System Monitoring

Contaminated groundwater is intercepted and treated in four areas of the Site. Three of these systems (MSPTS, ETPTS, and SPPTS) include a groundwater intercept trench (collection trench), which is similar to a French drain with an impermeable membrane on the downgradient side. Groundwater entering the trench is routed through a drain pipe into one or more treatment cells, where it is treated and then discharged to surface water. The fourth system (PLFTS) treats water from the north and south components of the GWIS and flow from the PLF seep.

Water monitoring at the MSPTS, ETPTS, and SPPTS includes a minimum of three sample collection points: untreated influent entering the treatment system, treated effluent exiting the system, and a surface-water performance location. At the PLFTS, the treated effluent and surface-water sampling locations are typically the same; this is discussed in further detail below.

The fundamental questions at each system are whether (1) influent water quality indicates treatment is still necessary, (2) effluent water quality indicates system maintenance is required, and (3) surface-water quality suggests impacts from inadequate treatment of influent.

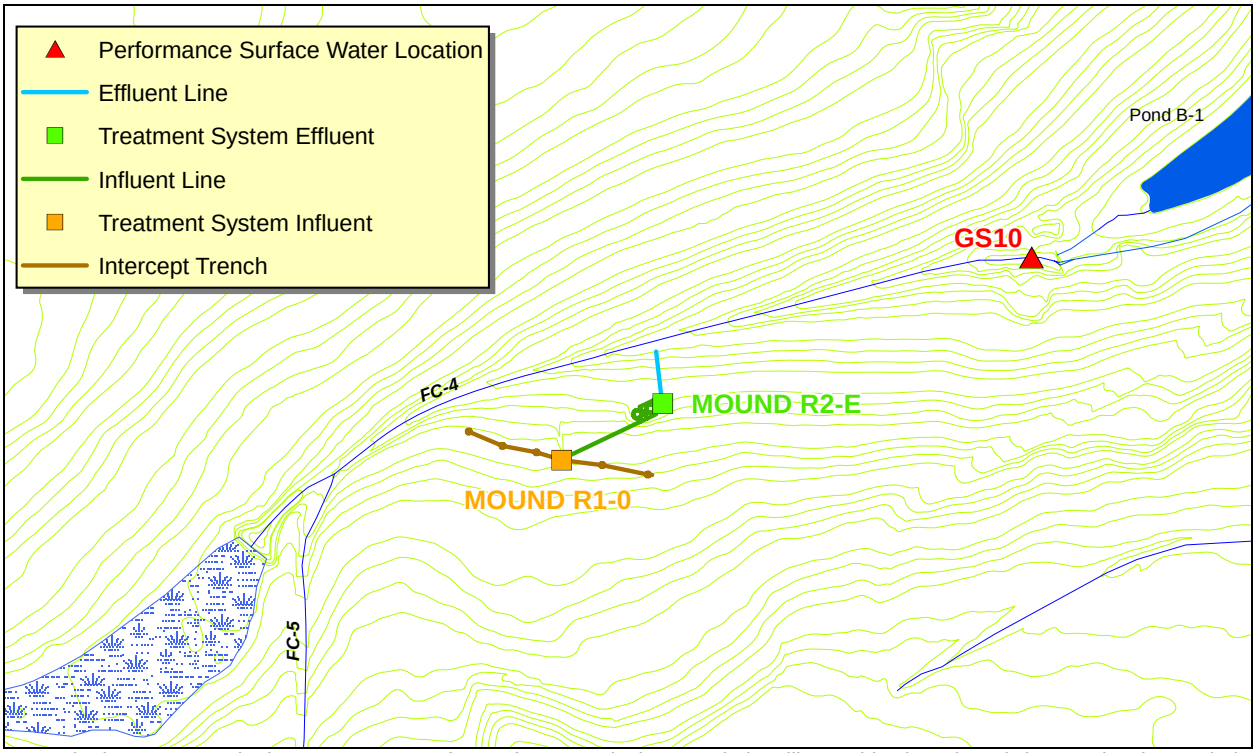
Note that groundwater monitoring wells also support the MSPTS, ETPTS, and SPPTS. These locations are not discussed in this section, but rather in that corresponding to their objective (i.e., text describing Sentinel and Evaluation wells).

Mound Site Plume Treatment System

Monitoring locations specific to the MSPTS are shown on Figure 3-39. Sampling and data evaluation protocols are summarized in Table 3-32. In addition to the monitoring locations shown, several monitoring wells are present, and several piezometers are present within the collection trench. One of the wells is monitored as a Sentinel well (see related text above), and the others will be abandoned in 2008. Although the piezometers are no longer routinely monitored, they are retained for troubleshooting purposes.

Table 3-32. RFLMA Sampling and Data Evaluation Protocols at MSPTS Monitoring Locations

Location Code	Location Description	Sample Types/Frequencies	Analytes	Data Evaluation
MOUND R1-0	Influent sampling location	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 11 in Appendix D
MOUND R2-E	Effluent sampling location	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 11 in Appendix D
GS10	Downgradient surface-water performance location	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 11 in Appendix D



Note: The intercept trench also captures water from a former 72-inch storm drain utility corridor (not shown) that previously emptied to South Walnut Creek (shown here as FC-4). This corridor runs from south to north, approximately parallel to the dominant trend of FC-5 shown here. It was backfilled and tied into the western portion of the intercept trench during Site closure activities. See the Annual Report for 2006 (DOE 2007e) for additional discussion, and subsequent sections of this 2007 report for updates.

Figure 3-39. RFLMA MSPTS Monitoring Locations

Data Evaluation

All MSPTS locations listed above were scheduled for routine monitoring in fourth quarter CY 2007. In addition, performance-check samples were collected. Results are provided in Appendix B and are discussed in Section 3.1.5.3.

East Trenches Plume Treatment System

Monitoring locations specific to the ETPTS are shown on Figure 3-40. Sampling and data evaluation protocols are summarized in Table 3-33. In addition to the monitoring locations shown, several monitoring wells are present, and several piezometers are present within the collection trench. Each of the wells is monitored as a Sentinel well (see related text above). Although the piezometers are no longer routinely monitored, they are retained for troubleshooting purposes.

Table 3-33. RFLMA Sampling and Data Evaluation Protocols at ETPTS Monitoring Locations

Location Code	Location Description	Sample Types/Frequencies	Analytes	Data Evaluation
ET INFLUENT	Influent sampling location	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 11 in Appendix D
ET EFFLUENT	Effluent sampling location	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 11 in Appendix D
POM2	Downgradient surface-water performance location	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	VOCs	See Figure 11 in Appendix D

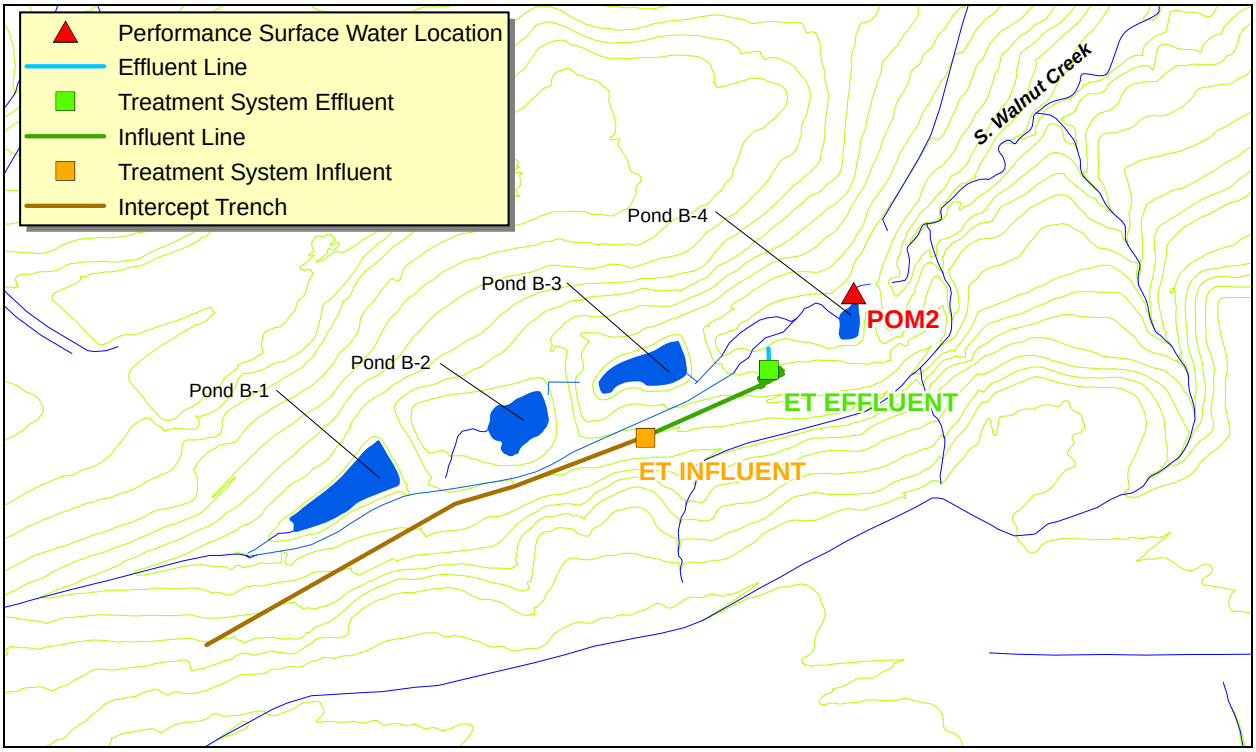


Figure 3-40. RFLMA ETPTS Monitoring Locations

Data Evaluation

All ETPTS locations listed above were scheduled for routine monitoring in fourth quarter CY 2007. In addition, performance-check samples were collected. Results are provided in Appendix B and are discussed in Section 3.1.5.3.

Solar Ponds Plume Treatment System

Monitoring locations specific to the SPPTS are presented on Figure 3-41. Sampling and data evaluation protocols are summarized in Table 3-34. In addition to the monitoring locations shown, several monitoring wells are present, and several piezometers are present within the collection trench. The wells are monitored as either Sentinel wells or Evaluation wells (see related text above). Although the piezometers are no longer routinely monitored, they are retained for troubleshooting purposes.

Table 3-34. RFLMA Sampling and Data Evaluation Protocols at SPPTS Monitoring Locations

Location Code	Location Description	Sample Types/Frequencies	Analytes	Data Evaluation
SPIN	Influent sampling location	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	U, nitrate	See Figure 11 in Appendix D
SPPMM01	Effluent sampling location	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	U, nitrate	See Figure 11 in Appendix D
GS13	Downgradient surface-water performance location	Semiannual grabs; Second and fourth calendar quarters (high- and low-water conditions)	U, nitrate	See Figure 11 in Appendix D

Notes: [a]Samples collected for U at GS13 are typically flow-paced, unfiltered, and analyzed for U isotopes; however, if desired they may be collected as grab samples and field-filtered. U data at GS13 support other monitoring objectives that are not addressed here.
Nitrate is analyzed as nitrate+nitrite as N; this result is conservatively compared to the nitrate standard only.

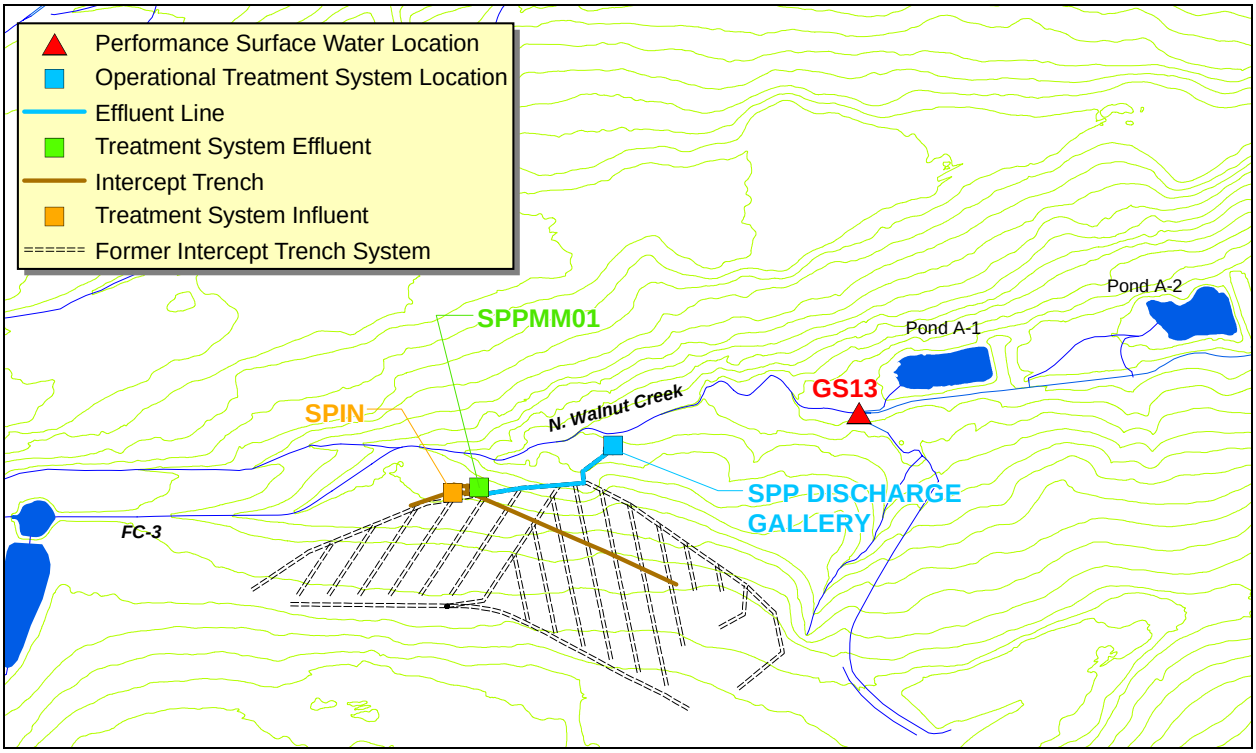


Figure 3-41. RFLMA SPPTS Monitoring Locations

Data Evaluation

All SPPTS locations listed above were scheduled for routine monitoring in fourth quarter CY 2007. The SPP Discharge Gallery (DG) was also sampled per the RFSOG; it, and location GS13, were sampled a second time in the fourth quarter to support WQCC discussions. Results are included in Appendix B.6; see Section 3.1.5.3 for discussion.

Present Landfill Treatment System

Water monitoring locations for the PLF are shown on Figure 3-35. The general groundwater monitoring requirements deal specifically with the RCRA wells and are discussed in detail in Section 3.1.2.8. Details regarding surface-water and treatment system monitoring are provided below.

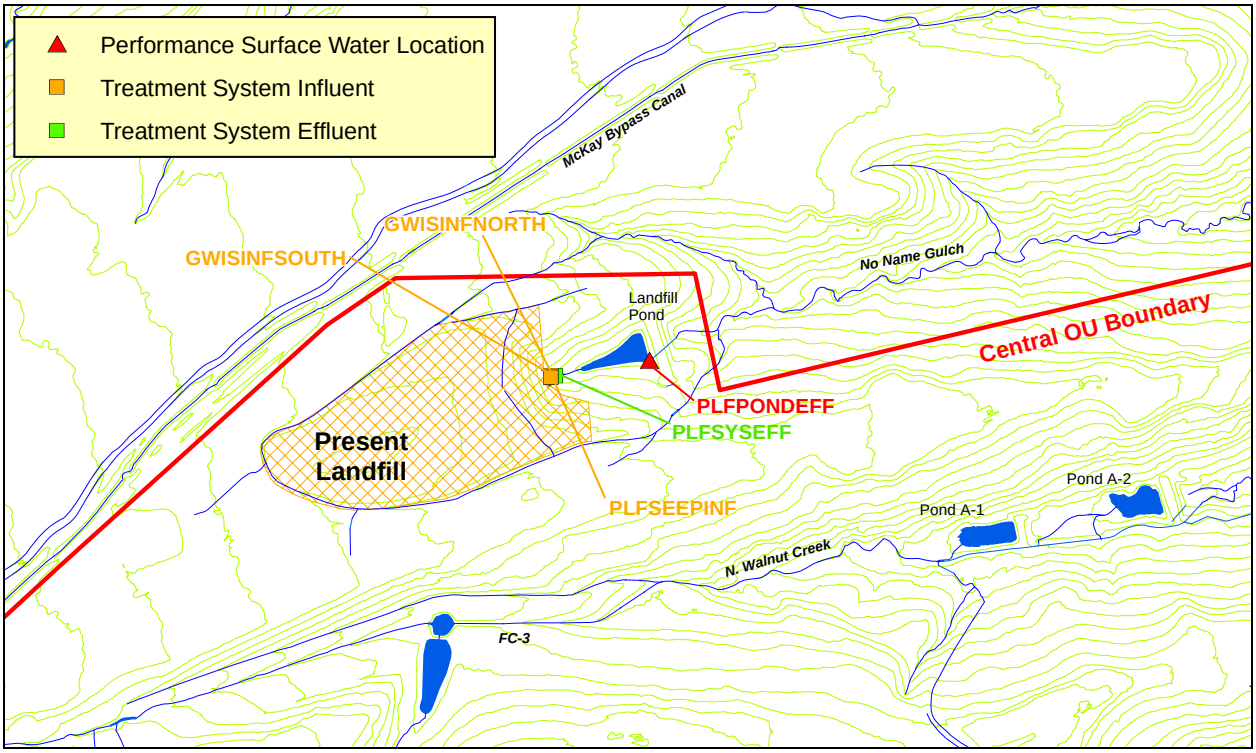
As part of PLF closure, a passive seep interception and treatment system was installed to treat landfill seep water and GWIS water. There are three sources of influent to the treatment system: two GWIS pipes and the PLF seep. Effluent for the treatment system eventually flows to the Landfill Pond. This section presents the monitoring data for the treatment system effluent as well as the Landfill Pond if the treatment system effluent exceeds surface-water standards. Details regarding PLFTS monitoring can be found in the PLF M&M Plan.

Monitoring locations for the PLFTS are shown on Figure 3-42. Sampling and data evaluation protocols are summarized in Table 3-35.

Table 3-35. Sampling and Data Evaluation Protocols at PLFTS Monitoring Locations

Location Code	Location Description	Sample Types/ Frequencies	Analytes	Data Evaluation
GWISINFNORTH	Northern GWIS influent to the treatment system	Quarterly grabs	VOCs, isotopic U, total and dissolved metals, nitrate	see Figure 11 in Appendix D
GWISINFSOUTH	Southern GWIS influent to the treatment system	Quarterly grabs	VOCs, isotopic U, total and dissolved metals, nitrate	see Figure 11 in Appendix D
PLFSEEPINF	Landfill seep influent to the treatment system	Quarterly grabs	VOCs, isotopic U, total and dissolved metals	see Figure 11 in Appendix D
PLFSYSEFF	Effluent from the treatment system	Quarterly grabs	VOCs, isotopic U, total and dissolved metals, SVOCs	see Figure 11 in Appendix D
PLFPONDEFF	Landfill Pond at the downstream (east) end	As needed; triggered by data evaluation	As needed; determined by decision rule	see Figure 11 in Appendix D

Note: Nitrate is analyzed as nitrate+nitrite as N.



Note: PLFSYSEFF serves as both the treatment system effluent monitoring location and a performance surface-water monitoring location.

Figure 3-42. PLFTS Monitoring Locations

Data Evaluation

Analytical results for the treatment system effluent (PLFSYSEFF) are compared to the appropriate surface-water standards listed in Table 1 of Attachment 2 to RFLMA. Table 3-36 lists the sample results that were greater than the applicable surface-water standard in CY 2007.

Table 3-36. PLFTS Effluent (PLFSYSEFF): Summary of CY 2007 Grab Sampling Analytical Results Exceeding RFLMA Surface-Water Standards

Analyte	Sample Date	Result	Units	RFLMA Standard	Basis for Standard[a]
Vinyl chloride	5/1/07	0.803	µg/L	0.023 (PQL = 0.2)	W+F
	6/5/07	1.40	µg/L	0.023 (PQL = 0.2)	W+F
	7/25/07	0.888	µg/L	0.023 (PQL = 0.2)	W+F
	8/31/07	0.610	µg/L	0.023 (PQL = 0.2)	W+F
Selenium	5/1/07	8.5	µg/L	4.6	AL
	6/5/07	5.0	µg/L	4.6	AL

Note: [a]Basis acronyms: W+F = Water plus Fish; AL = Aquatic Life.

For Se at PLFSYSEFF (Table 3-36), three consecutive months with Se results greater than the standard were not observed and sampling of the Landfill Pond was not triggered. The three consecutive months of VC results greater than the PQL at PLFSYSEFF (Table 3-36) did, however, subsequently trigger sampling of the Landfill Pond (PLFPONDEFF) per the RFLMA flow chart (Table 3-37 for detail). This sample was collected on September 6, 2007; VC was not detected in that sample.

Table 3-37. PLFTS Effluent (PLFSYSEFF): Summary of Monthly Analytical Results

Analyte	Sample Date	Result	Units
Vinyl chloride	**5/1/07**	**0.803**	**µg/L**
	6/5/07	1.40	µg/L
	7/25/07	0.888	µg/L
	Status:	Sampled Landfill Pond on 9/6/07; vinyl chloride was not detected.	

Note: The initial result triggering monthly sampling is shown in **bold**.

3.1.2.11 Pre-Discharge Monitoring

This monitoring objective deals with pre-discharge sampling of Ponds A-4, B-5, and C-2, or any other upstream pond functioning as a terminal pond, as a BMP to indicate compliance with surface water-quality standards (see Table 1 of Attachment 2 to RFLMA) at the downstream POCs. Pre-discharge samples are collected at Ponds A-4, B-5, and C-2 on North Walnut Creek, South Walnut Creek, and Woman Creek, respectively. These locations are shown on Figure 3-43. Sampling and data evaluation protocols are summarized in Table 3-38.

Table 3-38. Sampling and Data Evaluation Protocols at Pre-Discharge Monitoring Locations

Location Code	Location Description	Sample Types/ Frequencies	Analytes	Data Evaluation
A4 POND	Pond A-4 at east end of pond near outlet works	Prior to discharge	Pu, Am, isotopic U[a], nitrate	Consultation with regulators prior to discharge
B5 POND	Pond B-5 at east end of pond near outlet works	Prior to discharge	Pu, Am, isotopic U, nitrate	Consultation with regulators prior to discharge
C2 POND	Pond C-2 at east end of pond near outlet works	Prior to discharge	Pu, Am, isotopic U	Consultation with regulators prior to discharge

Notes: [a]Isotopes U-233,234; U-235; U-238.
Nitrate is analyzed as nitrate+nitrite; the nitrate+nitrite result is conservatively compared to the nitrate standard only.

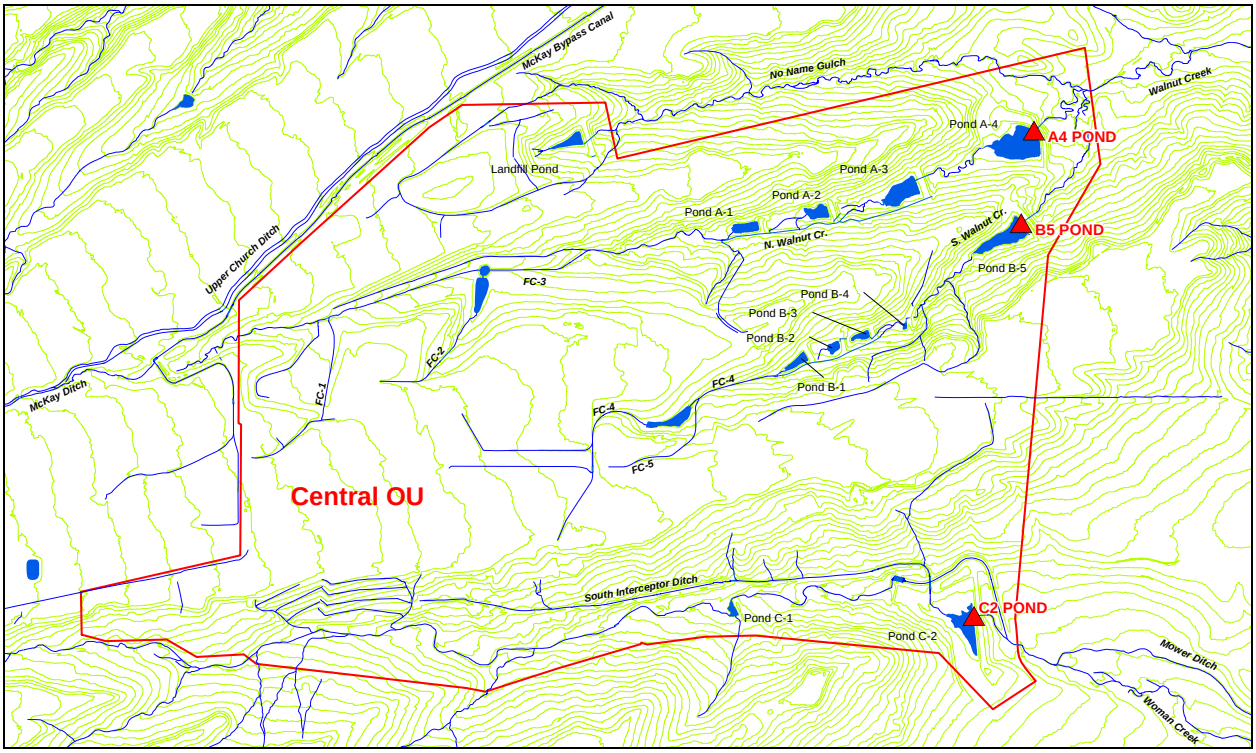


Figure 3-43. Pre-Discharge Sampling Locations

Data Evaluation

During CY 2007, pre-discharge samples were collected at Ponds A-4 and B-5. All data suggested, and was subsequently confirmed by POC sampling (see Section 3.1.2.1), that the planned discharges would not result in reportable compliance values at the downstream POCs.

3.1.3 Rocky Flats Hydrology

The following section provides information for all automated surface-water monitoring and precipitation gage locations at the Site that operated during CY 2007. For locations with continuous flow measurement, graphical discharge summaries are provided. Graphical summaries are also provided for all precipitation gage locations. Numerical discharge and precipitation values are included in the tables in Appendix A.